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A REPORT ON THE GEOLOGY OF THE PATAPSCO STATE PARK OF MARYLAND

BY

L. BRYANT MATHER, JR.

ASSISTANT CURATOR, DEPARTMENT OF MINERALOGY

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THE GEOLOGY OF THE PATAPSCO STATE PARK
OF MARYLAND

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National Park Service

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REPORT ON THE GEOLOGY OF THE PATAPSCO STATE PARK

INTRODUCTION

The Patapsco River has since earliest times played a dominant role in the history of the region through which it flows. Before white men came to this continent, the Indians knew the Patapsco, and the name it bears today is derived from the Indian word "Patapsqui", meaning "Black water". (H-11). The Chesapeake Bay, into which the Patapsco empties, first became known to Spanish explorers in the 16th century (I-10), and it is rumored that even before the English came to Maryland, there was a Spanish settlement in the Patapsco Valley which was wiped out by the Indians. (A-3) In 1608, Captain John Smith ascended the Chesapeake Bay and sailed into the Patapsco River, which he named "Bolus", presumably because of the "bole" clay he found on its banks near its mouth. He noted that the river was navigable for ships, and his map published later in 1612-1614 incorporated the results of this, the first geographical exploration ever made into the region which now includes the Patapsco State Park.

Elkridge Landing located at the head of navigation of the main branch of the Patapsco River, was a Colonial port of entry for maritime commerce. Between 1686 and 1704 the Maryland General Assembly passed acts establishing roads for the rolling of hogsheads of tobacco from the plantations of Central Maryland to tidewater for shipment to Great Britain. The Rolling Road now a paved highway, running parallel to Patapsco State Park is the most famous of these. For a long time it was in doubt whether Elkridge Landing, flourishing because of the commerce going through it via the Patapsco River and the Rolling Road, or Baltimore on the Northwest Branch of the Patapsco, would become the more important town. (A-3) Elkridge is now the post office for Patapsco State Park. Ellicott's Mills, now Ellicott City, was one of the first attempts to harness the water power of the "Fall Line Zone" in the Patapsco valley. From the time of its establishment in 1722, until the present day, this settlement has remained the leading town of the valley and is the county seat of Howard County. It was selected in 1827 as the western terminus of the first line of the then experimental Baltimore and Ohio Railroad, and it was along this line, through what is now Patapsco State Park, that the now famous race, between the B. & O's first steam engine and the horse-car, took place in 1830. In 1804 - 05 the Frederick Turnpike (now the Baltimore- Frederick Road) was established.

Just a few miles west of Ellicott City and of the Patapsco State Park, is Doughoregan Manor, the estate of Charles Carroll of Carrollton, the most famous of Maryland's signers of the Declaration of Independence. (A-3)

There have been many disasterous floods caused by the rapid rise of the river between its steep banks, perhaps the most famous being that of 1868. (H-1)

In recent years concerted effort has been made to preserve this beautiful region from despoilation so that it might, for all time, be a beauty spot available to the citizens of Baltimore, of

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Maryland and of the nation. Accordingly in 1910, with the acquisition of forty-three acres of woodland, by the Maryland State Board of Forestry, as a State Forest Reserve, the nucleus of the Patapsco State Park was formed. Much land which should certainly be acquired to unify the park remains in private hands, although the finest and most beautiful areas have been made safe. At the present time the park is being developed as a recreational area, provision being made for camping and picnic facilities, by the National Park Service cooperating with the Maryland State Board of Forestry with Civilian Conservation Corps labor.

This is the background of the region, whose geological features it is the purpose of the report to describe.

*****

PART I

PHYSIOGRAPHY OF THE PATAPSCO STATE PARK

Geographically the Patapsco State Park lies in parts of Baltimore and Howard Counties, in the state of Maryland, about eight miles from the center of Baltimore City. It lies between the meridians 76°40' and 76°50' west longitude and parallels 39°10' and 39°20' north latitude. Baltimore, and consequently, Patapsco State Park has a geographical position which is within one degree of the same latitude as Columbus, Cincinnati, Indianapolis, St. Louis, Topeka, Denver, San Francisco, Peking, Athens, Palermo, Istanbul, and Lisbon; and in the same longitude as Ottawa, Santiago, (Cuba), the Panama Canal, Quito, and Lima. (I-10 p.47)

Although the park areas extend along both banks of the Patapsco River for approximately nine miles, the total area of the state owned land is but 1200 acres. (H-4) The drainage is to the southeast via the Patapsco River to the Chesapeake Bay, as would be inferred from the NE-SW strike of the physiographic boundary on which the park lies.

Physiographically, as the accompanying map (Fig.1) shows, the park lies at the "Fall Line Zone" which is the dividing line between the Piedmont and the Coastal Plain Physiographic Provinces. For convenience the "Fall Line Zone" may be considered as following the B. & O.R.R. on its line to Washington. (I-10)

The Coastal Plain deposits being mainly sand, gravel, clay, and marl; and the Piedmont rocks being mainly of types that weather to a deep soil; rock outcrops in the region of Patapsco Park are to be found for the most part only in stream valleys, quarries, road and railroad cuts. The Coastal Plain formations overlie the hard rocks of the Piedmont Plateau with a gentle slope towards the southeast.

The boundary between the two provinces is not a sharp line but rather a zone of considerable width in which the uplands are covered by Coastal Plain sediments while the stream channels are cut in the hard Piedmont rocks. The falls are not confined to the boundary zone, but in many channels extend upstream 15 to 20 miles from the inland edge of the Coastal Plain.

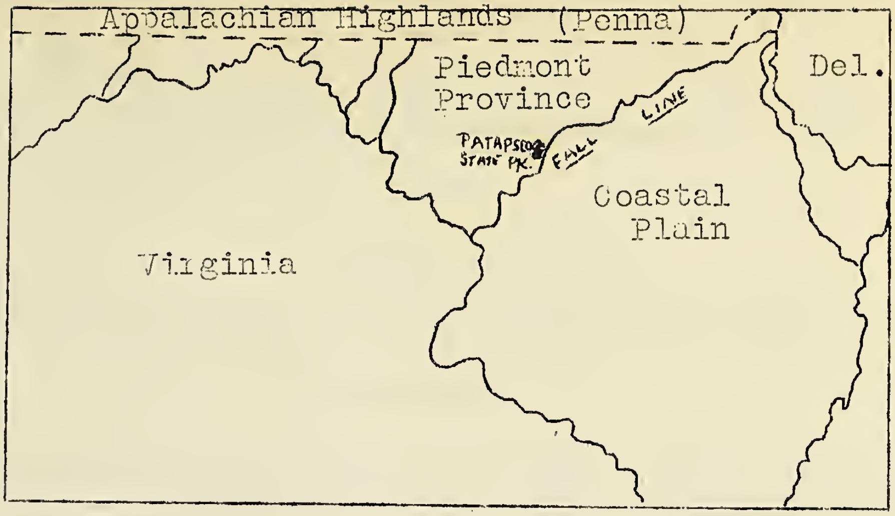

Fig. 1 Map showing the Physiographic Provinces of Maryland and the location of Patapsco State Park in relation to them. (after Jonas and Knopf, I-14 p.60)

The region physiographically is an eroded and dissected peneplain in the Piedmont rocks, flanked on the downstream side by Coastal Plain erosion terraces. The Piedmont metamorphics and intrusives were reduced either by subaerial erosion or marine abrasion to a peneplain. Then this peneplain was uplifted, the streams rejuvenated, and the marine side terraced with the subsequently deposited Coastal Plain sediments, hence many terraces are to be recognized sloping down to the Chesapeake Bay in the vicinity of Baltimore. There are three of these which are visible in the Patapsco valley at the State Park. These are: the Hamilton at 300', the Howard Park at 400', and the Catonsville at 500-520'. These three have been correlated with the Lafayette of Clark and with the Brandywine and Harrisburg of Bascom by Miss Knopf. (I-14 p.89)

The Patapsco River in the Patapsco State Park is a rejuvenated river, as are all the rivers of the Western Shore of the Chesapeake which flow over the Piedmont Plateau to the Fall Line. It is in the process of developing a dendritic type of drainage. (I-13 p.58) While it does not have the sweeping entrenched meanders so perfectly developed, as for example, in the upper Potomac Valley, the Patapsco River in the State Park has a sinuosity of course which is quite anomalous with the steepness of its valley. The rejuvenation of the river and terracing has been brought about by the relative uplifting of the land surface. However, in post-Pleistocene times there has been a relative subsidence of the land which has caused a "drowning" or submergence of the river mouths, transforming them into estuaries. Both of these movements of the land have caused far reaching results in respect to the human history of the Patapsco Valley. The rejuvenation and entrenchment of the river has afforded access to the interior for roads and railroads along the river valleys, as is admirably illustrated in the case of the Baltimore and Ohio. The uplift of the land in so far as it was the cause of the falls, has provided the reason for the building of canals which had so important a part in the pre-railroad history of American transportation. These same falls have also had a profound effect because of their value as potential sources of power.

The Patapsco River as it passes through the Patapsco State Park is superimposed upon the Piedmont Rocks into which it has cut its channel with complete discordance. The Coastal Plain cover which formerly extended much farther inland now has been removed by erosion from all except the hilltops nearest the "Fall Line Zone".

*****

PART II

GEOLOGICAL HISTORY OF THE PATAPSCO STATE PARK

INTRODUCTION

Geologically, the history of the region in which the Patapsco State Park lies is a history that is very long and quite unusual. While there occur in this area rocks of both igneous and sedimentary origin as well as their metamorphosed equivalents, the dominant rocks are igneous types both basic and acidic and more or less metamorphosed. The rocks of sedimentary origin are more thoroughly metamorphosed but, as is the case with the unconsolidated sediments, are of minor importance in respect to their areal distribution in the Patapsco State Park.

In Pre-Cambrian and Cambro-Ordovician times there was laid down a series of sedimentary rocks, which now metamorphosed range through schists, gneisses, marble, and quartzites. These rocks which comprise the so-called "Glenarm Series", rest unconformably on a metamorphic gneiss complex parts of which are of igneous and parts of sedimentary origin. This basement complex is known as the Baltimore Gneiss. Into this ancient series there has been intruded, in the Patapsco State Park region, a series of igneous rocks. When all these hard rocks had been reduced by erosion to base level, there were deposited in Cretaceous and again in Pleistocene times beds of sand, clay and gravel. These deposits, as a result of emergence and erosion followed by subsidence toward the Bay, are found in the region of the Patapsco State Park only on the hill tops and below the Fall Line Zone.

Of the original stratified series of metamorphis rocks, there is outcropping in the Patapsco State Park, only one, the Wissahickon Schist.

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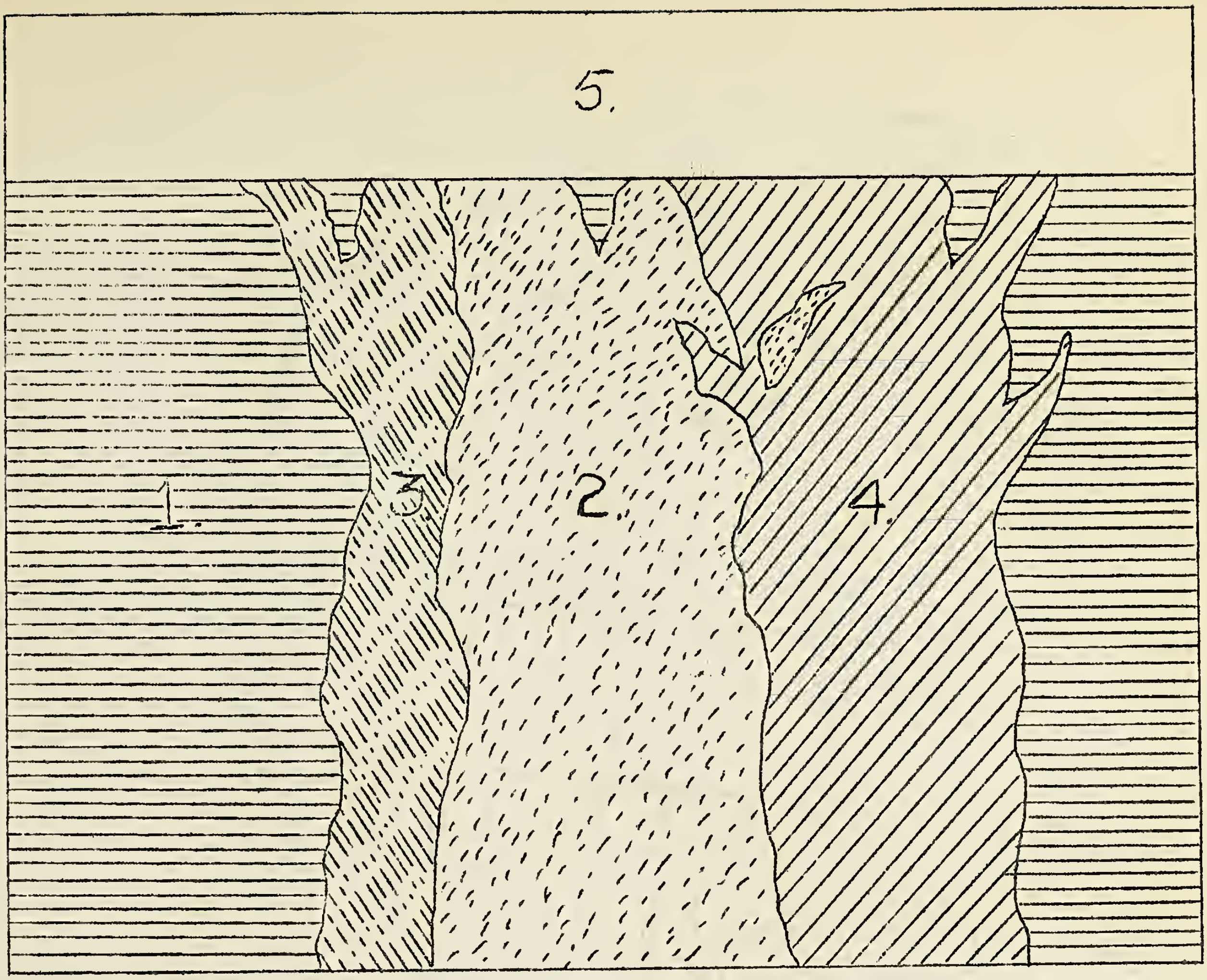

Fig. 2 GENERALIZED COLUMNAR SECTION OF THE ROCKS OF PATAPSCO STATE PARK SHOWING THEIR GENETIC AND STRATIGRAPHIC RELATIONSHIPS.

youngest	5.	Coastal Plain Sediments Cretaceous and Pleistocene
	4.	Ellicott City (Woodstock) and Ilchester Granite and Granite Gneiss and associated Pegmatites, and Aplites.
	3.	Relay Quartz Diorite and Granodiorite
	2.	Gabbro, ultra basics - Peridotite and Pyroxenite, and alteration products - Metagabbro, amphibolite and Serpentine.
oldest	1.	Wissahickon Formation (mica schist, gneiss and quartzite) representing the Glenarm Series.

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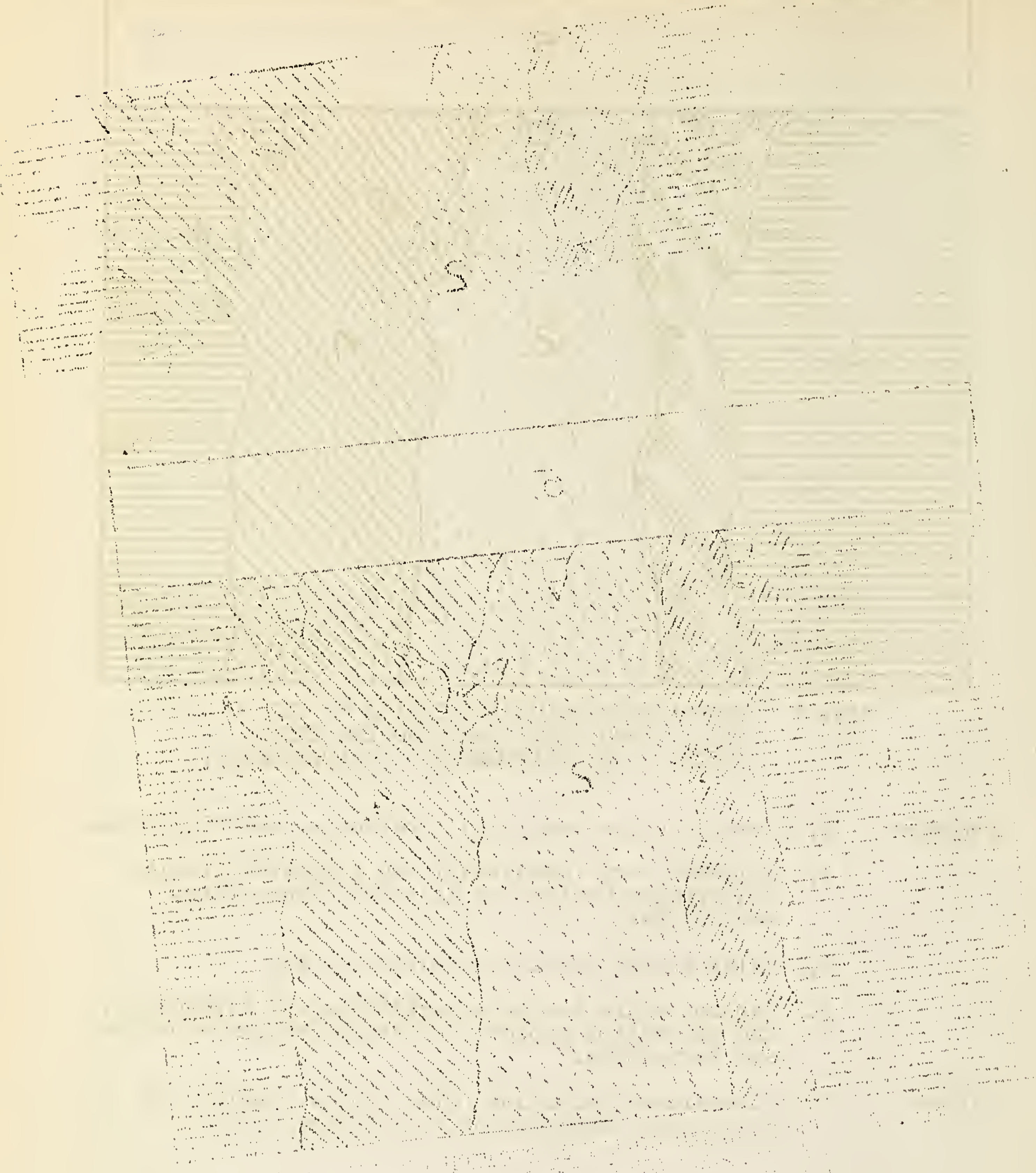
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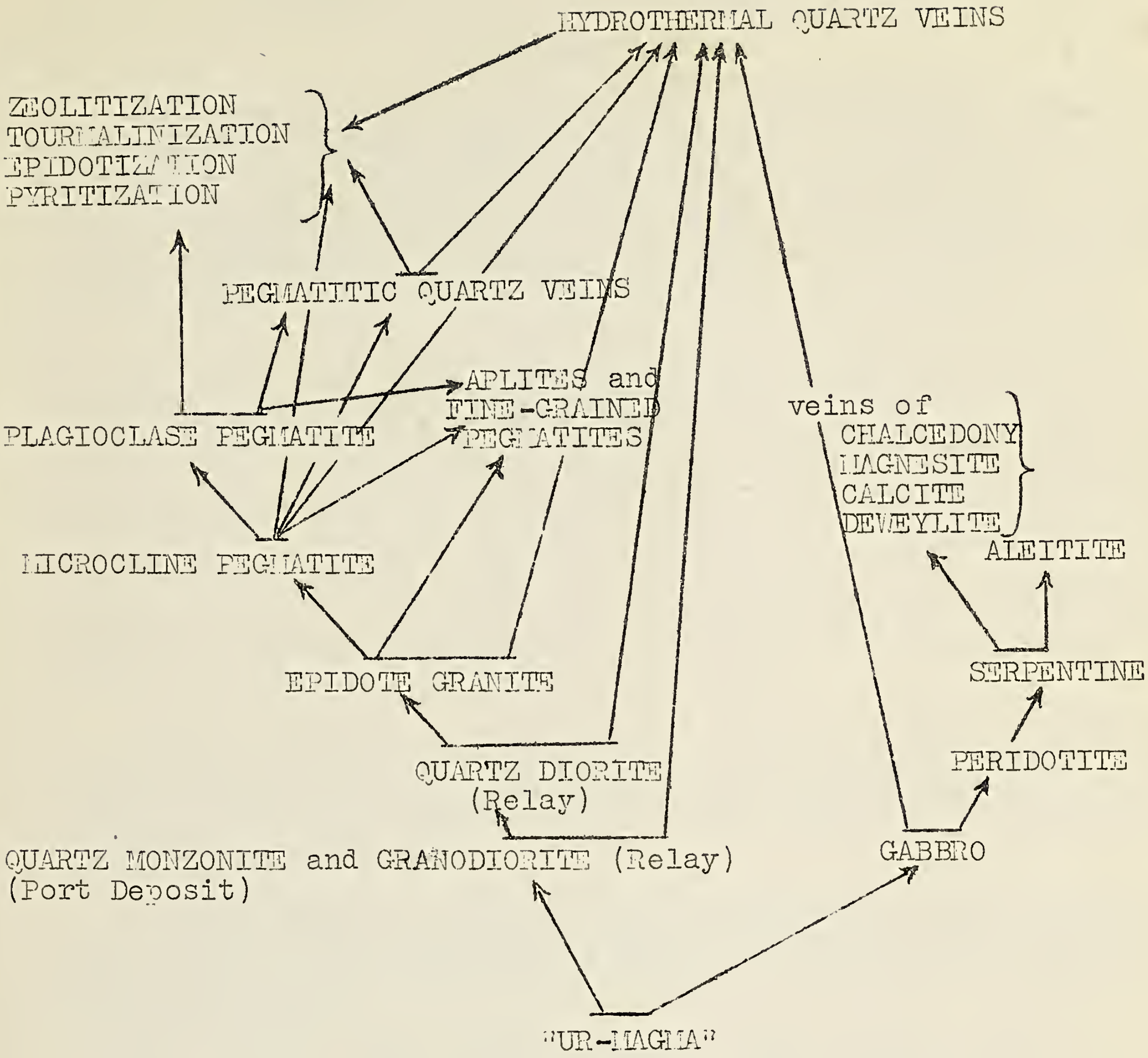
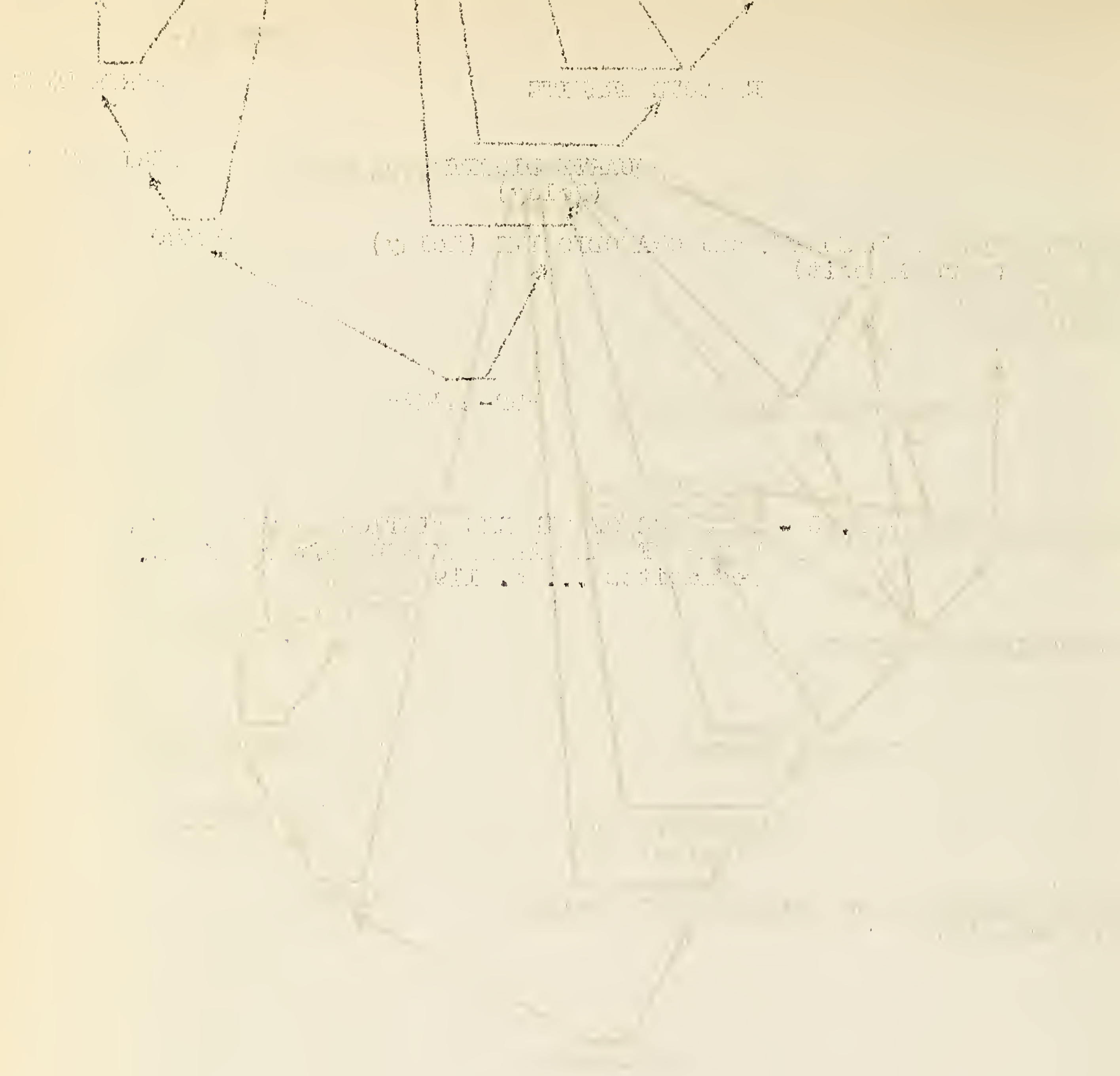


FIG. 3 - SEQUENCE OF DIFFERENTIATION OF THE IGNEOUS ROCKS OF CENTRAL MARYLAND after Watson. Pegmatites ... p. 119



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GEOLOGY OF THE CRYSTALLINE ROCKS

CRYSTALLINE ROCKS OF SEDIMENTARY ORIGIN

WISSAHICKON SCHIST

The Wissahickon formation, named from Wissahickon Creek, near Philadelphia, Penna., where it is typically exposed, is described by Jonas and Knopf (I-14 p.104) as a "crystalloblastic oligoclase mica gneiss, mica schist and quartzite" with a thickness of approximately 1500'. The facies of this formation which occurs in Patapsco State Park, in general, is found surrounding the Baltimore Gneiss domes and occupying the synclinal hills.

The rock has been completely recrystallized and strongly folded, specimens having been collected in the State Park showing well developed ptygmatic folds. The schist shows by its complete recrystallization and by its content of various heavy minerals such as, staurolite, garnet, cyanite, and sillimanite that its present condition has been developed by deep seated metamorphism. (I-14,p.170) That the original material was a sediment may be inferred from the heterogeneous character of the formation, the presence of abundant rounded grains of zircon, from the occurrence of cyanite and staurolite, minerals high in alumina; and from the chemical composition of the rock which does not coincide with any known igneous type. (I-14,p.170)

The Wissahickon schist weathers readily into a micaceous clayed soil, which when wet has the consistency of putty. It forms deep ruts, making roads which are almost impassible in wet weather. The soil sparkles brilliantly owing to the presence of numerous mica flakes.

An analysis of a sample of the oligoclase- mica facies (that which occurs in Patapsco State Park) quoted by Jonas and Knopf (I-14,p.172) from Penniman and Brown of a sample from Monkton, Maryland shows:

SiO_2	70.26	FeO	2.70	TiO_2	1.35	H_2O	1.85
Al_2O_3	12.87	MgO	1.49	Na_2O	2.55		
Fe_2O_5	2.61	CaO	2.19	K_2O	2.15		

Cleavage has been developed to such an extent that the bedding is usually obscured. It is probable that the major folding is wide and gentle, and the dip when visible, is rarely more than 15 - 20 degrees. (I-14,p.175) The dip of the schistosity is however often quite steep, Cohen (J-5) states that at Hollofield the dip of the schistosity of the Wissahickon is vertical.

The original materials of the Wissahickon were arkosic beds resulting from near shore sedimentation derived from the decay of adjacent igneous feldspathic rocks. (I-14, p.193) The Wissahickon is the most extensive of the Glenarm formations. Elsewhere it is interrupted by areas of Baltimore Gneiss elongated in the direction of the regional strike of the Piedmont i.e. NNE to ENE or NE-SW strike.

*****

THE CRYSTALLINE ROCKS OF IGNEOUS ORIGIN

GABBRO AND ASSOCIATED IGNEOUS ROCKS AND THEIR METAMORPHIC EQUIVALENTS.........

The gabbro exposed in the Patapsco State Park is the oldest igneous rock of the region and is part of and the type exposure of, an equant block of about fifty square miles area lying just west of Baltimore City and known at the Baltimore Gabbro complex. The area has an irregular batholithic outline and is located in the midst of structural domes of Piedmont rocks. The gabbro is situated on the eastern flank of the Piedmont syncline adjacent to the Coastal Plain overlap. The gabbro (J-5) clearly occupies an inter-Baltimore gneiss area. The distribution of the gneiss areas, moreover, indicates that this distribution is the cause rather than the effect of the position of the gabbro. Therefore the intrusion of the gabbro accompanied or is younger than the Baltimore Gneiss uplifts.

The only formation that is certainly cut by the gabbro is the Wissahickon schist. The other contacts are intrusive against the gabbro or of doubtful relation. (J-5)

The gabbro complex is composed of many distinguishable facies; the most important differentiation being between the gabbro proper and the associated ultra-basics - peridotite and pyroxenite and their alteration product serpentine. "Gabbro" is used by Jonas and Knopf (I-14, p.107) to include the following: hypersthene gabbro, olivine gabbro, metagabbro, etc. These rocks are partially metamorphosed and in some places the primary structures have been deformed to virtual obliteration; isoclinal folding has been noted at places.

"Amphibolite" is Cohen's (J-5,p.50) term for the dominant basic rock. Another variation is noted by Cohen (J-5,p.50), a "gabbro-pegmatite" near Union Dam, across the river from the State Park, in which the hornblende phenocrysts reach a size of 2" across. At Ilchester Station on the B. & O. in the bank leading up to Mt. St. Clement's College there is an outcrop of basic rock of igneous origin which has not altered entirely to talc. This outcrop is said by Secrist (H-3) to be "Cortlandite" of C. H. Williams. Hobbs (J-3) also notes this occurrence and shows in a sketch boulders marked "Cortlandite" in the hillside above the railroad. Cortlandite is defined (J-7) as "G. H. Williams' name for a peridotite composed mostly of hornblende and olivine occurring in the Cortlandt series not far from Cortlandt on the Hudson River near Peekskill; and was formerly called Hudsonite by Cohen."

The weathering of the gabbro gives rise to a soil of deep red color which grades into a stiff red clay. The color is distinctive and is often made more characteristic by the presence of residual, spheroidal weathered gabbro boulders or "niggerheads".

The hornblende gneiss or metagabbro at Ilchester is recorded by Williams (J-20, p.681) as having a cleavage dip of 60 - 70 degrees N 55°W. and a strike N 55°W.

As to the explanation of the presence in the gabbro complex of the ultra-basics; Cohen concludes (J-5,p.69) that the ultra-basics owe their origin to early segregation within the gabbro magma. Watson, on the other hand, (J-2,p.205) says, "the peridotites are probably intrusive into the gabbro.

At the gabbro - schist contact inclusions (xenoliths) of schist are abundant in the gabbro. The gabbro in many places along its contacts forms as contact phenomena, garnet reaction halos. These garnets are usually very small but some collected near the Hollofield station were up to 1½" in diameter.

Serpentine is best exposed at the N.P.S. Road Stone Quarry below Union Dam south of Hollofield. Nearby in the field below the Hollofield Fire Lookout Tower were found specimens of "Honey-Comb" rock. Cohen explains the origin of this material as follows: (J-5,p.80) "Wherever serpentines are found at high levels on the old peneplain, chunks of iron-stained silica with a cellular structure are found. These are generally tabular with a maximum dimension varying from a few inches to ten feet. Between the siliceous septa are empty cells. Inside are coatings often of quartz rhombohedra, opal or chalcedony. In a single specimen the cells were found filled with antigorite. These have only been produced where erosion has been so slight as not to keep pace with rock decay."

Another feature characteristic of the serpentines which is well shown in the State Park outcrops is the occurrence of polished or "Slickensided" surfaces. These are caused by a differential movement along joint planes producing a friction that polishes the surfaces. The movement is due to an expansion in volume that takes place when the minerals of the original peridotite are altered and hydrated to serpentine (antigorite and chyrsotile) (I-14,p.132) Often these polished surfaces are covered with the Picrolite, and Williamsite varieties of Antigorite - this is true of many of the slickensides in the Patapsco State Park.

Cohen observes that, "the one significant feature is the harmony of the structural elements in the gabbro intrusive with those in the surrounding rocks. The contact is always conformable."

The alteration of the gabbro minerals of the Baltimore complex was the subject of exhaustive study by Dr. G. H. Williams of the Johns Hopkins University, from the standpoint of microscopic petrography. This study made just fifty years ago established the region as a classic area for the study of the alteration of hornblende to uralite, and of plagioclase to saussurite.

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THE RELAY QUARTZ DIORITE

The Relay Quartz Diorite is a pinkish rock composed of oligoclase, quartz and muscovite. The quartz diorite (Cohen J-5) is younger than the gabbro and small dikes of it cut the gabbro at many places. There is no sharp contact between them but rather a zone in which the Relay quartz diorite and the amphibolite alternate. This is best seen along Soapstone Branch between Rolling

Road and the river.

This rock (Watson J-2) which occurs between the gabbro and the Coastal Plain extends in a dike averaging ¼mile in width all the way from Woodberry in northern Baltimore City. The selective intrusion, no doubt (J-5) follows a line of weakness alongside the gabbro.

The structural elements of this rock have been produced by primary flow movements (Cohen J-5 after Cloos, E.) The rock may be contemporaneous with the granite intrusion although Jonas and Knopf doubt it. It is much shattered and somewhat metamorphosed. Jonas and Knopf (I-14,p.130) record the presence of secondary accessory allanite, epidote and fibrous, feathery horneblende.

The Relay Quartz Diorite (Cohen J-5) has brought about great changes in the gabbro. Contact alterations of the gabbro are found everywhere on the southeastern contact. The contact amphibolites differ markedly from the normal amphibolites in their susceptibility to weathering. The rock which usually appears as a rotten, fractured, almost brecciated mass is typical of weathered outcrops of this contact material. Its close-jointing and fractures facilitate the rapid weathering. At times the fractures are filled with a felsic sheet which gives the rock outcrop the appearance of a much more acidic rock.

Aplitic dikes associated with the Relay quartz diorite cut the gabbro. Their margins show horneblende needles with a texture similar to the feathery amphibolites. Associated with these horneblendic rocks are, at times, bands of a rock dominantly epidote - hence, epidosites. An occurrence of this type was noted on State Park property near Avalon Dam, Howard County.

Jonas and Knopf (I-14) suggest (p-1310) that it is possible that the Relay quartz diorite may represent a local differentiate of the Port Deposit granite gneiss in which the potash of the potash feldspar has been crystallized as muscovite mica.

*****

ILCHESTER AND ELLICOTT CITY GRANITES

Jonas and Knopf in mapping Baltimore County (C-3) mapped all of the granite of this region as Woodstock granite. Cohen (J-5) writes as follows: What is here called 'Ilchester Gneiss' was referred to by Hobbs (J-3) as a facies of the Ellicott City granite, but is recognized by E(rnst) Cloos as a dynamically metamorphosed rock unlike the Ellicott City granite. It is a quartz, potash feldspar gneiss with the approximate mineral composition:

Quartz	45%	Muscovite	7.5%
Microcline	25%	Albite	2.5%
Orthoclase	20%		100.0%

The Ellicott City granite (Cohen continues J-5) is a local occurrence of the Woodstock granite. Dark, elongated, and flattened ellipsoidal inclusions occur which have been regarded as autoliths by E. Cloos (C-2) rather than 'almost swallowed up xenoliths' as they were regarded by Jonas and Knopf (I-14). The rock consists of

quartz, microcline, microperthite, a sodic oligoclase, myrmekite biotite and accessories. In hand specimen it is a typical "pepper and salt" granite. Jonas and Knopf (I-14,p.134) describe the Ellicott City granite as "a biotite quartz monzonite of epi-Carboniferous age, making it a member of the youngest series of intrusive rocks of the region."

As to its genesis Cloos (C-2,p.134) says "The granite entered as a new factor along the pregranitic surface of the gabbro- Wissahickon schist contact." The contact between the granite and the schist thereby created is very indented and very irregular, as is schematically shown on the geological map appended to this report. (Appendix 1) "The Wissahickon schist salient is completely soaked with granite and broken into thousands of inclusions. The granite-gabbro contact is smooth; the ratio of granitic dikes in the schist to those in the gabbro, being about 10,000:1." (Cloos G-2) This shows that the granite followed the contact and respected the gabbro because of its much greater resistance. Cloos (G-2, p.137) continues: "This spot where the granite intruded was the weakest spot in the gabbro - schist system, namely, near the point where the schist salient crosses the axis of the gabbro body. We cannot assume that the small granite intrusion had the necessary force to push apart the very resistant gabbro blocks on each side along steep contacts. The only way out was upwards, partly at the expense of the weaker Wissahickon schist, the latter was penetrated very thoroughly. A large amount of broken up schist material was carried away, especially above the center of the intrusion. The granite intrusion began along the schist - gabbro contact and continued and widened during the process... The writer believes that the Ellicott City granite is not the head of a larger batholith, which eats its way up into the crust at any point, but that we deal with 'selective intrusion' for it has picked out the weakest spot available beginning along petrographic boundaries widening the gap slightly by carrying away the flexible and strongly schistose material. The intrusive force seems to have been halted completely by the gabbro but remained very effective within the Wissahickon schist."

"The different intrusive force of the gabbro and the granite might very well result from the fact that the gabbro intruded into a space which widened upward enlarging its horizontal surface constantly, but the granite was squeezed into a narrow steep canal of constant cross-section."

These rocks show (I-14),p.105) some cataclastic deformation.

Watson (J-2,p.141) quotes the following figures from Piggot, C.S., "Radium in Rocks", Amer. Jour. Sci. 5th Ser. vol XVII No. 97 p.30 1929. "Ilchester Granite: 1.935 X 10^{-12} gr. Radium/ gr. rock. "Woodstock Granite: 1.448 x 10^{-12} gr. Radium/ gr. rock. Watson states that this indicates a Carboniferous age for these intrusives as a result of computations by A.C. Lane from F. Bascom.

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PEGMATITE

The pegmatite dikes of Maryland are of two types: 1). Potash-soda, quartz rich dikes; 2). Soda rich, quartz free dikes. The latter known as Albitites, are limited in occurrence in Maryland to Cecil County and it is believed may be differentiates from the same parent magma as the gabbros with which they are intimately associated. (I-12,p.98) All the dikes of the Patapsco State Park are of type one.

Though the pegmatites are younger than the gabbros and in certain places are seen to cut them, their restriction to the foliated rocks as opposed to the gabbro masses near at hand is quite striking. In the river valleys, e.g. the Patapsco, one may pass through areas of schist and gneiss that have been extensively pegmatized and yet in adjacent masses of gabbro or metagabbro not find one single stringer. (J-2). This same respect for the superior resistance of the gabbro as opposed to that of the schists was shown by the granites.

It is assumed that the pegmatite material was ejected upwards from great depths from the same magma as the granite and deflected by the great solid block of the gabbro around the edges of which it ascended. These dikes are not believed to be of hydrothermal origin; although some of the quartz veins which accompany them are found so far from their parent rock that they must have been hydrothermal in origin. (Watson J-2,p.70)

In simple pegmatites microcline is the first mineral to form and later mineralization replaces the microcline. This explains the presence of microcline relicts in the Maryland pegmatites. (Watson J-2,p.108) In the pegmatite dikes at Hollofield the microcline has been extensively replaced by quartz. In the pegmatites at Orange Grove specimens showing crystals of quartz with prismatic faces and both terminations have been collected, well developed in a microcline matrix. In the pegmatite at Ilchester on the grounds of Mt. St. Clements College the microcline obviously froze first and large crystals showing several faces have been collected, one of these had a maximum dimension of 7". Watson states (J-2,p.14) that at Ilchester in a pegmatite body nearly one mile across which carries albite, microcline, and quartz in nearly equal amounts that these minerals crystallized simultaneously.

Perthic and myrmekitic intergrowths are abundant. In fact the Howard County slope of the river from above Ilchester to below Orange Grove in the Patapsco State Park area is strewn with splendid examples of "Graphic Granite".

The dikes at Ilchester are found in the position of cross joints of the gabbro and the Ellicott City Granite. They are banded coarse grained layers alternating with fine grained aplitic ones. These bands have a primary origin. Cloos (G-2,p.132) says that as the banding of the pegmatites is always parallel with the dike contacts, the strike and dip may be found. The best example may be seen below the Ilchester (Bloede) Dam. Most of the pegmatites form large dikes which dip gently to the eastward at an angle of approximately 20-30 degrees. Because their debris covers the slopes of the river valley they appear to be larger and more numerous than they really are.

ADDENDUM

Since this paper was prepared for publication there has appeared a new volume on Maryland Geology (1) which contains data pertinent to questions here discussed. From the paper by E. Cloos (2) the following table giving new light on age relations is condensed:

Age	Formation or rock type
Epi-Paleozoic?	Woodstock Granite) with pegmatite and Ellicott City Granite) aplite dikes
Post-Lower Ordovician	Relay Quartz Diorite Baltimore Gabbro
?	Pyroxenite peridotite
Pre Cambrian? (Paleozoic?)	Wissahickon Schist (Glenarm Series)

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(1) Maryland Geological Survey Vol. 13 1937.

(2) Ibid Chap. I "Crystalline Rocks of Maryland" p.33

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Many geologists have attributed the peculiar character of the pegmatites to the presence of rare minerals (Watson J-2,p.29) and in general discussions of 'magmatic differentiation' the volatile constituents: F. Cl. B. SO_4, Co_2, etc. are given an important role in the process. However in Maryland these rocks are developed with these minerals practically nonexistent in most of the dikes.

With the exception of one or two dikes near Orange Grove (Watson J-2,p.74) there is no relation between the coarseness of grain and the proximity of the wall rock. Chilled borders are very rarely observed, and coarse crystals may form in thin stringers and patches as well as in the centers of large dikes. This shows that the crust as a whole must have been hot during the plutonic injection. The Eastern Piedmont must have been buried to the depth of several thousand feet.

Although some of the pegmatites are quite coarse grained, at no place are the phenocrysts developed to such a large size as they are in other parts of the country, no phenocryst observed this summer had a larger maximum dimension than one foot.

In the Frederick Road quarry at Ellicott City, Watson (J-2, p.120) observes that some of the pegmatitic stringers have been faulted with the granite while other dikelets in the same quarry remain undeformed. This, he points out, indicates a contemporaneity of intrusion and regional deformation.

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GEOLOGY OF THE COASTAL PLAIN SEDIMENTS

The Coastal Plain sediments of the region of the Patapsco State Park, belong to two groups. Those of Cretaceous age belong to the Lower Cretaceous - Potomac Group; while those of Pleistocene age belong to the Columbia Group.

These formations are for the most part composed of unconsolidated sand, gravel, and clay with occasional lignite and glauconite beds. There are some indurated ledges of iron cemented sandstone or conglomerate i.e. "pudding stone". Limonite, hematite or siderite are the cementing agents.

The most important aspect of these Coastal Plain formations as they are found in this immediate vicinity is their topographic expression in erosion terraces, discussion of which was made under Part I "Physiography".

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PART III

THE MINERAL RESOURCES OF THE PATAPSCO STATE PARK

The industrial and commercial value of the mineral resources of the Patapsco State Park is largely potential, and dependent on the discovery of new processes and the creation of new demands. There are no known occurrences of metallic ores which could be made commercially usable. In nonmetallic resources the chief are: feldspar, building stone, crushed stone, with flint and asbestos as minor possibilities.

BUILDING STONE

The granite and the gabbro have both been quarried in this region for use as building stone, and there is at present in operation one small quarry in the metagabbro. The granite quarries along the Patapsco River at Ellicott City were probably opened in the latter part of the eighteenth or early in the nineteenth century and have produced more product from the standpoint of volume and of value than any other mineral exploitation in the region. From these quarries came the stone for the Roman Catholic Cathedral in Baltimore and for the greater number of the characteristic granite curb stones of the city. These quarries are not now in operation, because of the cost of further operations has been made prohibitive by the increased value of the adjacent land. (I-14,p.242 Mathews and Watson)

The metagabbro is being quarried on a small scale along the south side of Bull Branch in the Glenartney area of the Patapsco State Park by the National Park Service and is being used in construction in the park development.

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CRUSHED STONE -- ROAD METAL

The gabbro and serpentine are being worked for crushed road material in the State Park region. Near Hollofield Station in Baltimore County a quite extensive quarry is being worked by J. E. and H. T. Mallonee in the gabbro. The entire output is crushed for road stone, much of it being used in macadam. In Howard County, in the Hollofield Area of the State Park, just below Union Dam, the National Park Service operates a small quarry in a very much serpentinized ultra-basic rock. This rock is pulverized and used in state park road construction. Spheroidal "niggerheads" of unaltered rock are encountered throughout the deposit and interfere with the operation of the pulverizer. A small opening on the property of the Dickey (Oella) Mill Co. at the Baltimore County end of Union Dam, has been worked for stone which has been used in repairing the mill race embankment. The rock is a weathered metagabbro.

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SAND AND GRAVEL

Along the Baltimore - Washington Boulevard, two or three miles east of the Patapsco State Park, there are extensive workings for sand and gravel in the Cretaceous deposits of the Coastal Plain, that locality being well below the fall line. There have been in these same deposits prospects and commercial workings for sedimentary iron ores and for oxides of manganese. Within the Patapsco State Park, however, the Coastal Plain deposits are not extensive enough nor situated advantageously enough to be of any commercial importance whatever as mineral resources.

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FELDSPAR

The feldspar deposits of Maryland are of two types. In Baltimore, Howard, Carroll and Montgomery Counties occurs potash soda feldspar in quartz-rich dikes, while in Cecil County there occurs soda feldspar in quartz free albitite dikes. All the dikes in the State Park Region are of the former type.

Although no feldspar is being quarried in the Patapsco State Park or vicinity at the present time, there has been considerable production in the past and there remains a huge potential supply. In 1915 the Baltimore Feldspar Company was a large producer from the Ilchester Quarry on River Road just below Bonnie Branch which is now State Park property. Other rather extensive openings were located on the O'Connor and the Pindell properties south of Ilchester. The Hollofield Quarries on the Baltimore County side of the river just below the Hollofield Station are among the most extensive workings in the Patapsco Valley. At this locality the abandoned equipment included steam engines and rail dump cars. Smaller quarries were worked on the Ashton and St. Mary's College properties. This latter quarry is referred to throughout the literature as the "Mt. St. Clement's College" quarry by Singewald (I-12) and Watson (J-2) although the college is at present called St. Mary's College.

Singewald reports: (I-12,p.106) In 1925 the Spa Nola Products Co. erected an extensive, electrically operated feldspar mill on the O'Connor farm south of Ilchester. At the present time this mill has been completely destroyed and overgrown. Small amounts of crushed feldspar can be found piled in and near these ruins and is probably typical of the mills product.

Singewald observes: (I-12,p.106) "Maryland pegmatites that might be used as sources of potash are numerous and large....sorted material is said to have run 9 - 11% potash in carload lots. The unsorted rock averaged 7 - 8% potash in tests run by the author. The enormous masses of fine grained pegmatites occurring along the Patapsco River between Orange Grove and Ilchester.... afford an unlimited quantity of pegmatitic rock suitable for the extraction of potash." This feldspar is also available for the production of alumina if demand and processes become available to make it economically feasible.

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FLINT

Flint is the trade name for vein and dike quartz. According to Singewald (I-12,p.131 ff.) flint has been worked at three localities in the general region of the Patapsco State Park, all in Howard County. One was on Lawyer's Hill, up Rockburn Branch from River Road, ½ mile south of Avalon. This working exposes a vein at least 10 feet wide which was worked in 1917 for about 150 feet along the strike. The rock here is a small lens in the country rock and is of good quality well jointed milky quartz. The other localities were; ½ mile west of Ilchester, and 1 mile south of Hollofield. None of these has been worked in the last twenty years, and prior to that time they were worked for only a short time chiefly by local farmers.

Several other occurrences of flint have been noticed in the Patapsco State Park proper, and probably are quite similar to those worked. At one place about 1200' SW of the City Water Dam at Avalon the hillside is heavily strewn with quartz boulders of good quality. At another place north of Glenartney above the stone quarry on Bull Branch near the electric power cut the hillside is strewn with milky quartz boulders slightly stained with iron oxide.

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ASBESTOS

About .6 miles north east of Hollofield station on the property of Mr. Fred Boc on the west side of Dogwood Road there is a deposit of asbestos (Anthophyllite) which is sporadically worked by Mr. Boc, who extracts an average of about a carload a year. Smaller pockets of identical material are encountered in the serpentinized rock at the N.P.S. road stone quarry near Union Dam. It seems quite probable that these pockets are geologically similar and that the occurrence of asbestos is limited to such small deposits, formed by special weathering of certain ultra-basics along with general serpentinization. The pockets encountered in the State Park have not as yet been large enough to be of any importance commercially. It is of interest to note that at this same locality, the N.P.S. road stone quarry, in which the occurrence of anthophyllite asbestos has been noted, that there also occur thin veins and stringers of Chrysotile or serpentine asbestos.

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WATER RESOURCES

The water resources of this area are those directly connected with the Patapsco River and those in connection with the subsurface water of the river valley. Since the Patapsco State Park lies on, and just above the "Fall Line Zone", it is natural to assume that there is much potential water power in connection with the falls. Mention has been made in the introduction of the establishment in 1722 of Ellicott's Mills. According to the State Department of Forestry there have been since that first mill nine other power developments along the river between Relay and Hollofield. (K-3) At the present time but three of these are in use; and these operate mills at Oella, Ellicott City and Ilchester. The others including the Bloede hydroelectric Dam south of Ilchester are not being used. The dam at Avalon was formerly used as a reserve by the Baltimore County Water Supply system and is now property of the Baltimore City Bureau of Water Supply. Water supply for the region comes from the Baltimore City supply which is taken from the Gunpowder River northeast of Baltimore City.

Throughout the Patapsco State Park are numerous springs which are being developed as sources of drinking water for those who visit the park by the National Park Service.

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PART IV

THE MINERALOGY OF THE PATAPSCO STATE PARK

INTRODUCTION....

In the Patapsco Valley in the vicinity of the Patapsco State Park, one would from a consideration of the areal geology, expect to find an extensive and varied list of minerals. There occur numerous basic and acidic igneous intrusives of various kinds in many stages of alteration, including abundant granitic pegmatites and some gabbro pegmatite. There are metamorphic schists, stream bed alluvial deposits, and Coastal Plain sediments. In spite of all this however there are few rare minerals to be found. The schists contain as megascopic accessories only garnet and tourmaline. The pegmatites and granites are both megascopically free from the rare minerals that make similar deposits elsewhere mineralogical bonanzas.

MINERAL CHECK LIST

The minerals reported to occur in Patapsco State Park are listed below according to their numbers in Dana's System of Mineralogy (J-13)

--	1.	Diamond	There have been no reported diamond finds in the Patapsco State Park. There are, however, alluvial deposits such as have in other parts of the Eastern United States e.g. Plattsburgh, N.Y. (J-13), yielded an occasional diamond.
1.	13.	Gold	There have been no reported gold finds on the State Park property itself, although many unverifiable rumors are abroad in the valley, especially in regard to the possibility of gold in the area north of Glenartney, and in the valley of Soapstone Branch. Gold has been found in vein quartz similar to that occuring in the State Park, at Catonsville. (J-15). I believe that small quantities of gold can be found in Patapsco State Park.
--	34.	Molybdenite	has not been found in the park area itself as yet. There occur quartz veins in the State Park similar to those which for example in the Ruby Quarry near Sykesville, 15 mi. NW of Hollofield, -(I-12),p.148) which have yielded molybdenite flakes in vein quartz.
2.	45.	Galena	has been found near Glenartney, but this occurrence seems not to be relocatable. The only known specimen is in the collection of the Department of Mineralogy of the Natural History Society of Maryland. Watson (J-2) lists galena as one of the sulfides occurring with Maryland potash-soda pegmatites.

3.	74.	Pyrrhotite	occurs at the little quarry at the Baltimore county end of the Union Dam in metagabbro. The specimens are in anhedral lumps with pyrite and magnetite. Pyrrhotite occurs in the pegmatites a few miles north of Hollofield (H-5), and is listed by Watson (J-2) as one of the sulphides occurring in pegmatite.
4.	83.	Chalcopyrite	Some of the pyrite of the Patapsco State Park contains copper (See below). Chalcopyrite is mentioned by Watson (J-2) as occurring in Maryland Pegmatite.
5.	85.	Pyrite	occurs in the N.P.S. building stone quarry on Bull Branch in the metagabbro and in vein quartz in lumps up to $1\frac{1}{2}$" in diameter. Occurs in pegmatite near Vineyard. In vein quartz near Hollofield Fire Tower occur pseudomorphs of limonite after cubic pyrite.
--	175.	Fluorite	is rumored (H-8) to occur in the Patapsco Valley, but its occurrence is extremely improbable.
6.	210.	Quartz	is the most abundant mineral of the Patapsco State Park. It occurs in every rock type except the most ultrabasic types. It formes a rock type itself in quartz dikes and veins. It, as such, forms deposits of potential commercial value as flint, (see Flint under Mineral Resources Part III) Often found in rough crystals in pegmatite, as at Orange Grove where a doubly terminated prismatic crystal 2" in length has been found. It is the mutual and earliest forming constituent with feldspar of "Graphic Granite", which is very common. It composes the great percentage of Coastal Plain sands and gravels and the river bed alluvium. It is found as smoky, milky, ferruginous, and transparent varieties. Secondary druses of rhombohedral crystals are found lining the septa of "Honey-comb rock" i.e. weathered serpentine, deposited from siliceous waters.
7.	210 A. 212	Chalcedony) Opal)	found forming and lining the septa of the "honey-comb" rock found near the Hollofield Fire Tower.
8.	223.	Water and Ice	occur as running water, ground water, as precipitation, and as ice in winter.

--	231.	Corundum	A single crystal of corundum was found in the serpentine at Soldiers Delight, a few miles north of Hollofield by Williams (G-12) and one in the Serpentine of Harford County by Johannsen (I-12,p.282) and is to be expected in the serpentine of the Patapsco State Park
9.	232.	Hematite	occurs as sedimentary red iron ore in the Coastal Plain deposits, and has been collected in the alluvial wash at the mouth of Soapstone Branch, Glenartney. In the pegmatites south of Ilchester it occurs as a metallic film between cleavage surfaces of feldspar. It forms a large part of the vivid red coloring matter in the soil derived from the weathering of gabbro.
10.	233.	Ilmenite	occurs in vein quartz, tabular massive layers near the Hollofield Fire Tower. This analysis and determination was made by Dr. W. T. Schaller, U.S.G.S. (personal communication 9/12/36) It was reported by Dana (J-13) as occurring in Gabbro diorite at Ilchester with rutile and surrounded by "Titanomorphite" q.v.
11.	237.	Magnetite	occurs in gabbro as massive lumps as at quarry at Baltimore County end of Union Dam, and in pegmatite as radiating micro tufts Watson (J-2)
--	241.	Chromite	occurs in every other serpentine deposit in Maryland and is to be expected in the Patapsco State Park Serpentine.
12.	250.	Rutile	is reported by Dana (J-13) as occurring in gabbro diorite at Ilchester with Ilmenite and Titanomorphite q.v.
13.	257.	Goethite	occurs as fibrous crystalline (anisotrophic) seams in sedimentary Coastal Plain iron ores, e.g. Washington Boulevard at Elkridge.
14.	258.	Manganite	occurs as black druses lining cavities in massive Coastal Plain iron ores as for example along the Washington Boulevard at Halethorpe.
15.	259.	Limonite	occurs as sedimentary iron stone, the most common iron ore of the Coastal Plain deposits. Also is the cementing agent in Coastal Plain sandstones and conglomerate-pudding stones, and as an alteration product of sedimentary siderite. Found as pseudomorphs after pyrite

in vein quartz near Hollofield Fire Tower in pegmatite near Glenartney and in metagabbro at N.P.S. Bull Branch Quarry. It forms a considerable percentage of the iron oxide in the soil formed by the weathering of gabbro.

16. 269. Psilomelane occurs as dendritic films on serpentine, steatite, and chlorite schist at N.P.S. Road stone quarry. Also forms dendritic films elsewhere in the Park.

17. 270. Calcite has not been collected on Park property itself. Is found in veins at Mallonees Quarry south of Hollofield just north of Patapsco State Park.

18. 273. Siderite occurs as sedimentary iron ore in the Coastal Plain deposits where it is known as "Gray or Hone Iron Ore" and weathers to Limonite.

-- 313. Orthoclase Cohen (J-5) refers 20% of the mineral content of the Ilchester granite gneiss to this species. Watson, (J-2,p.30) says "Orthoclase is not believed to occur in the Maryland pegmatites at all." It is the opinion of the writer that none of the feldspar of this region can be referred to the species "Orthoclase."

19. 315. Microcline is the common pinkish feldspar of the granites and the pegmatites. Its occurrence is the basis of the commercial exploitation of feldspar in this region. It is the first mineral to form in the normal pegmatite and forms the matrix for quartz in Graphic Granite. At the Mt. St. Clement's Quarry it occurs in crystals up to 7" in diameter.

20. 316 - 320 Plagioclase Family (Albite to Anorthite): various members of this family occur in many of the rock types of the region. The species Oligoclase is the one to which the feldspar of the Wissahickon schist is referred. Andesine, Cleavelandite, Albite and other plagioclases are listed by Watson (J-2) and others as constituents of the granites and pegmatites. The feldspars of the gabbro and diorite are especially Bytownite, Olioclase, and Anorthite and their alteration product Saussurite.

21. 323. Enstatite and Bronzite are frequent constituents of certain gabbro facies. In the Hollofield area there is one outcrop composed entirely of Enstatite hence an "Enstatitite".

22. 324. Hypersthene Hypersthene gabbro is differentiated as a definite gabbro facies by Williams (G-11) and by Jonas and Knopf (I-14) and occurs near Orange Grove and in the Hollofield Area. Its occurrence near Ilchester is reported by Dana (J-12).

23. 325. Pyroxene Family Augite and Diallage are mentioned as occurring in the gabbroic rocks of this region.

24. 337. Anthophyllite Anthophyllite asbestos occurs north of Hollofield and at the N.P.S. Quarry near Union Dam see under "Asbestos" in Part III.

25. 338. Amphibole Family The minerals of this family form the greater part of the gabbroic rocks. In fact Cohen (J-5,p.50) describes as Amphibolite the dominant basic rock of the Baltimore Gabbro complex. The specific minerals which have been reported are: Horneblende-Ordinary, feathery, acicular and poecilitic (Dana J-12); Tremolite from N.P.S Road Quarry at Union Dam; Actinolite (G-12); Smaragdite (J-12,J-19); Pargasite (J-5); and their alteration product Uralite (I-14,p.111).

26. 370 Garnet Family The garnets of the Patapsco State Park have been referred to the Almandite - Spessartite series. They occur as small trapezohedra in pegmatites and as large dodecahedra in gabbro as reaction halos at pegmatite contacts, e.g. south of Hollofield where they occur with prismatic tourmaline to 1¼".

27. 376. Crysolite (Olivine) occurs as distinguishing feature of olivine gabbro differentiated by Jonas and Knopf, (I-14) and as an essential constituent of Cortlandite (see under Part II "Gabbro") reported by Hobbs (J-3).

28. 394. Zircon A micro constituent of several pegmatite dikes as at the Ilchester Quarries on River road below Ilchester near Bonnie Branch. (J-2) Also a micro constituent of the Wissahickon schist (I-14,p.169).

29. 406. Zoisite Zoisite occurs in the meta gabbro at the N.P.S. Quarry on Bull Branch with epidote and elsewhere in the gabbro complex. It is with Epidote, Clinozoisite, and Pistocite according to Watson (J-2,p.38).

30. 407. Epidote occurs well crystallized as a vein in the granite on River road in the State Park at the Bloede Dam south of Ilchester. Also in the metagabbro at the N.P.S. quarry on Bull Branch and elsewhere in the gabbro complex. Reported by Watson (J-2,p.38) as occurring with zoisite etc. in crystals up to 6" in length. Reported by Dana (J-12) from the Ellicott City Granite Quarries.

31. 409. Allanite is a micro constituent of pegmatites recorded by Watson (J-2,p.38). From Ilchester by Shannon (J-19) after Hobbs (J-3) and in parallel growths with epidote from the quarries on the left bank of the Patapsco River at Ellicott City by Dana (J-12).

32. 426. Tourmaline occurs abundantly in the Wissahickon mica schist and associated quartz veins at Hollofield near the Fire Tower and in the Edmondson Avenue Extension cut, as accessory minerals. Occurs in large prismatic crystals in gabbro with large garnets as a contact mineral south of Hollofield on the Baltimore County side of the river.

33. 445. Laumontite occurs as well crystallized vein and cavity lining in the massive gabbro near Avalon at the Howard County end of the Baltimore City Water Dam. This not previously described occurrence is in the gabbro just a very short distance from the Relay quartz diorite contact, and is in many ways very similar to the occurrence of Laumontite in the gabbro at Woodberry in Baltimore City in the same quarry with the Relay quartz diorite contact there.

34. 458. Muscovite has been found by the writer in pegmatite as at Orange Grove in sheets up to 5" wide, and is recorded by Watson as occurring near Hollofield in sheets up to 6" - 8" across. (J-2) The muscovite usually has a greenish tint but is the normal potash variety (J-2).

35.	458A.	Sericite	occurs as the dominant mica of the Wissahickon schist outcrops and as the alteration product of pegmatite muscovite when weathered.
36.	462.	Biotite	is a primary constituent of the Ellicott City Granite and is found in certain pegmatite facies (J-2).
37.	468 - 470.	Chlorite Family	Members of this family have not been differentiated in their occurrence in this region. Chlorite forms the essential constituent of Chlorite schist occurring as an alteration product of certain facies of the gabbro complex as at the N.P.S. quarry near Union Dam. At the Mallonee quarry south of Hollofield in Baltimore County and in Baltimore County near Union Dam it occurs in sheets up to 2½" in width.
38.	481.	Serpentine-	Antigorite formed as the alteration product of certain ultra-basics, the essential constituent of the rock serpentine with chrysotile. The original filling of the septa of the "Honey comb" silica found near the Hollofield Fire Tower (Cohen, J-5, p.50)
39.	481A.	Serpentine	- Chrysotile the fibrous, crystalline equivalent of antigorite with which it composes the rock serpentine. Occurs as thin veins and stringers as "asbestos" at the N.P.S. Quarry near Union Dam. Also as varieties Picrolite and Williamsite in the slickensides.
---	482.	Deweylite	Deweylite is found as a vein material in almost every occurrence of serpentine in Maryland. It is to be expected in the serpentines of the Patapsco State Park.
40.	484.	Talc	is the mineralogical constituent of the rock "Soapstone" or Steatite. It forms outcrops on the Howard county side of the river near Avalon, above Glenartney along Soapstone Branch (Cohen J-5); near the Hollofield Fire Tower, at the N.P.S. Quarry near Union Dam, at Ilchester Station after Cortlandite.

41.	485.	Sepiolite ?	or related substance occurs as vein material at N.P.S. Quarry at Hollofield near Union Dam, in serpentine and associated with Saponite ? (see below)
42.	488.	Saponite ?	occurs as wax - like veins in serpentine at N.P.S. Hollofield quarry near Union Dam. Qualitative analysis checked as "hydrous magnesium silicate" by W. T. Schaller U.S.G.S. (personal communication 9/12/36).
43.	492.	Kaolinite	occurs as alteration product of feldspar in pegmatite and granite outcrops where weathering has progressed to any considerable extent. Also forms beds of white clay in the Coastal Plain sediments.
44.	492.	Halloysite ?	Greenish claylike crusts and films on granitic and pegmatitic outcrops may be referred to this species.
45.	510.	Titanite	was reported by Willaims from the vicinity of Ilchester. Envelope shaped crystals were reported by Dana (J-13) as occurring at the quarries on the left bank of the Patapsco River at Ellicott City. Brown and yellow sphene (titanite) was reported from the "patapsco" granite in 1837 by Tyson (G-13).
46.	510A.	Titanomorphite	Dana reported (J-13) the occurrence at Ilchester in the "gabbro diorite" of titanomorphite surrounding rutile and ilmenite. Titanomorphite is described (J-8,pp.486, 689) as the white alteration product of rutile and ilmenite to which most so-called Leucoxene may be referred. The occurrence of titanomorphite at Ilchester is also recorded by Williams (G-12).
47.	549.	Apatite	has been reported as a micro constituent of the pegmatites by Watson (J-2) and as a micro constituent accessory to the Wissahickon schist by Jonas and Knopf (I-14,p.169).

The following minerals are of probable or possible occurrence in the Patapsco State Park:--

1.	254.	Pyrolusite	with Maganite or Pailomelane.
2.	271.	Dolomite	with calcite or in the Cockeysville marble at the edge of the Wissahickon formation.

3. 399. Sillimanite - Fibrolite as an accessory constituent of the Wissahickon formation.

4. 400. Kyanite (Cyanite) as an accessory constituent of the Wissahickon formation.

5. 428. Staurolite as an accessory constituent in the Wissahickon formation.

6. 490. Glauconite as a constituent of sandy beds and marl in the Coastal Plain deposits.

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PART V

BIBLIOGRAPHY

MAPS

A 1. Shell 1935 Road Map "Delaware, Maryland, Virginia, West Virginia" ± 21 mi/in. H. M. Gousha Co., Chicago, Ill.

2. Shell 1936 Road Map "Metropolitan Baltimore" ± 1.3 mi/in. H. M. Gousha Co., Chicago, Ill.

3. "Historical and Literary Map of Maryland" by Edwin Tunis Enoch Pratt Free Library, Baltimore, 1931.

4. Shell 1935 Road Map "Metropolitan Baltimore" ± 1.3 mi/in. H. M. Gousha Co., Chicago, Ill.

5. "Map of Greater Baltimore" 1/24000 April 1919 R. L. Montague Lucas Bros., Baltimore.

B. United States Department of the Interior United States Geological Survey.

1. "Patapsco Quadrangle" 1/125000 Edition of 1908 printed 1934 contours 20' Sea level datum.

2. "Relay Quadrangle" 1/62500 Edition of 1907 printed 1931.

3. "Laurel Quadrangle" 1/62500 Edition of 1926 printed 1932 polyconic N. A. datum 500 yd. grid U.S.

4. "Ellicott Quadrangle" 1/62500 Edition of 1906 printed 1926 polyconic N.A. datum.

C. Maryland Geological Survey (maps)

1. "Map of Maryland" 1/187500 3 mi/in. 1907 Central Sheet William Bullock Clark.

2. "Map of Maryland - showing the Geological formations and the Agricultural Soils" M.G.S. 1907 1/500000 8 mi/in. supplement to Vol. VI 1906. MC.S.

3. "Map of Baltimore County and Baltimore City showing the Geological Formations" M.G.S. 1/62500 E. B. Mathews 1925

4. "Map of Baltimore County and Baltimore City showing Forest Areas by Commercial Types" 1/62500 F.W. Besley 1914

5. "Map of Baltimore County and Baltimore City showing the Agricultural Soils" M.G.S. 1/62500 E. B. Mathews 1919

6. "Map of Anne Arundel County showing topography and Election Districts" M.G.S. 1/62500 1920

7. "Map of Anne Arundel County showing topography and Election Districts" M.G.S. 1/62500 1907

8. "Map Showing the Roads System of Baltimore County Maryland" Baltimore County Roads Engineer and M.G.S. 1/62500 1919

9. "Map of Baltimore City and Vicinity" M.G.S. 1/62500 1904

10. "Geological Map of Baltimore and Vicinity" published by the Johns Hopkins University on the topographic base of the United States Geological Survey. George H. Williams - editor 1892. Geology of the Crystalline Rocks by G. H. Williams; Geology of the Sedimentary Formations by N. H. Darton. (Property of E. H. Sapp M.G.S.)

11. "Map of Howard County showing Topography and Election Districts" M.G.S. E. B. Mathews 1/62500

D. United States Department of the Interior -- National Park Service University of Maryland -- State Department of Forestry; cooperating. Patapsco State Park #2 (maps)

1. "Key Map - Master Plan" Plate One #3 Md. 2 SP2-215 J. B. Vanderploeg 1200'/in.

2. "Ilchester or Lower Area - Progress Map" #3 Md.2 SP2-220 5/31/35 400'/in. Ed. Barber

3. "Hollofield or Upper Area - Progress Map" #3 Md.2 SP2-221 5/31/35 400'/in. Ed. Barber contour interval 50' S.L. Datum

4. Ilchester or Lower Area "E" Eastern Section Master Plan Plate Two" #3 Md.2 SP2-216 J. V. Vanderploeg 400'/in.

5. "Patapsco State Park- Master Plan " J. B. Vanderploeg 1"-/200' Drawing # SP-2-28.

State Department of Forestry

6. "Topographic Map Ilchester to Relay" 2000/in. Blue Print at Baltimore office 1411 Fidelity Bldg. Made Aug. 1913. Only existing copy.

PAMPHLETS

G. 1. "Trailside Notes" #1 Yellowstone Park, National Park Service

2. "Structure of the Ellicott City Granite" Maryland - Ernst Cloos Nat'l. Acad. of Sci. vol. 19 #1 pp.130-38 Jan. 1933. Copy from M. H. Secrist, J.H.U.

3. "Patapsco State Forest Reserve" Maryland State Board of Forestry-Forestry Leaflet #20.

XVI International Geological Congress, Washington, D. C. 1933 Guidebooks

4. "Southern Appalachian Region" Guidebook #3 Excursion A-3 Charles Butts, G. W. Stose, A. I. Jonas - U.S.G.S.

5. "Chesapeake Bay Region" Guidebook #5 Excursion A-5 Lloyd W. Stephenson, C. W. Cooke, W. C. Mansfield - U.S.G.S.

6. "Geomorphology of the Central Appalachians" Guidebook #7 Excursion A-7 Douglas Johnson, Columbia University.

7. "Southern Pennsylvania and Maryland" Guidebook #10 Excursions B-1, B-2, B-3. G. W. Stose, A. I. Jonas, G. H. Ashley, U.S.G.S.

8. "The Baltimore and Ohio Railroad" Guidebook #30 Excursions A-2, A-6, C-1, C-2, C-3, C-4. George P. Grimsley, B.&O. R.R.

9. "A Gazetteer of Maryland" Henry Gannett U.S.G.S. Bulletin #231 Series F 1904

10. "Map and Description of Antietam Battlefield Site etc." U.S. Department of the Interior National Park Service.

11. "Notes on the Minerals occurring in the Neighborhood of Baltimore" G. H. Williams Johns Hopkins University 1887

12. "Contributions to the Mineralogy of Maryland" G. H. Williams Johns Hopkins University 1889.

13. "A Descriptive Catalogue of the Principal Minerals of the State of Maryland" P(hillip) T. Tyson 1837.

14. "Bulletin Natural History Society of Maryland" Vol. IV #2 pp.10-11 "Baltimore Minerals" by L. Bryant Mather, Jr. October 1933.

15. "Rocks and Minerals Magazine" Vol. 11 Nos. 1,2,3, pp (1) 7-10; (2) 26-28, (3) "Minerals of the District of Columbia and Vicinity" by Titus J. Ulke.

16. "The Construction of Relief Models" General Instructions (Revised January 1936) Howard E. Rothrock geologist Branch of Planning and State Cooperation. 113307 figures E.C.W. Technical Circular #1 January 1936 Dept. of the Interior; N.P.S.

17. "Guides and Symbols" -- to be used in presenting plans for the Branch of Planning -- National Park Service.

18. "The Patapsco" vol.2 no. 8 CCC Co. #356 Camp SP2 Elkridge, Md.

GENERAL REFERENCE SOURCES

H. 1. "Query file" Maryland Room Enoch Pratt Free Library Central Branch, Baltimore, Md.

2. "Vertical File" Maryland Room Enoch Pratt Free Library Central Branch Baltimore, Md.

3. Conference: M.H. Secrist, Instructor in Geology, Johns Hopkins Univ. June 19, 1936.

4. Conference: W.C. Dennis; H.S. Ladd; - Richmond, June 19, 1936.

5. Records of the Department of Mineralogy of the Natural History Society of Maryland, 2103 Bolton Street, Baltimore, Maryland.

6. Notes on courses, Geology Department, Johns Hopkins University 1934-36.

7. Conferences: Dr. John A. Russell, Arbutus, Md.

BOOKS

MARYLAND GEOLOGICAL SURVEY PUBLICATIONS

I 1. Volume 1 (1897) 539p. A. Introduction - W. B. Clark; B. Historical Sketch - W. B. Clark; C. Physical Features of Maryland - W. B. Clark; D. Bibliography - E. B. Mathews; E. Magnetic Work - L. A. Bauer.

2. Volume 2 (1898) 509p. A. Administrative report - W. B. Clark; B. Building and Decorative Stones of Maryland" - G. P. Merrill, E. B. Mathews; C. Cartography of Maryland - Henry Gannett, E. B. Mathews.

3. Volume 3 (1899) 461p. A. Highway Introduction - W.B. Clark; B. Topography, climate, and geology as they affect Highways - W. B. Clark; C. Highway Legislation - St. G.L. Sioussat; D. Present Condition of Maryland

Highways - A. N. Johnson; E. Construction and Repair of Roads - E. N. Johnson; F. Road Metals - H.F. Reid; G. Administration of Roads - H. F. Reid; H. Advantages of Good Roads - H. F. Reid.

4. Volume 4 (1902) 524p. A. Palezoic Appalachia - Bailey Willis; B. Highways of Maryland - H. F. Reid, A. N. Johnson; C. Clays of Maryland - Heinrich Ries.

5. Volume 5 (1905) 656p. A. Magnetic Work - L. A. Bauer; B. Allegany-Garrett County Boundary - L. A. Bauer; C. Highways of Maryland - A. N. Johnson; D. Coals of Maryland - W. B. Clark et al.

6. Volume 6 (1906) 578p. A. Physical Features of Maryland - W. B. Clark, E. B. Mathews; Exhibits - W. B. Clark; C. Highways - A. N. Johnson; D. Highway Construction - W. W. Crosby; E. Counties of Maryland - E. B. Mathews.

7. Volume 7 (1908) 412p Mason-Dixon Line Survey.

8. Volume 8 (1909) 486p A. Highway Construction - W. W. Crosby; B. Mineral Industries - W. B. Clark, E. B. Mathews; C. Limestones - E. B. Mathews, J. S. Grasty.

9. Volume 9 (1911) 348p. A. Highway Construction - W. W. Crosby; B. Final Highway Report - W. B. Clark, W. W. Crosby; C. Iron Ores and Industry - J. T. Singewald, Jr.; D. Magnetic Work to 1910 - L. A. Bauer.

10. Volume 10 (1918) 553p. A. Geography of Maryland - W. B. Clark; B. Water underground - W. B. Clark, E. B. Mathews, E. W. Berry.

11. Volume 11 (1922) 549p. A. Coal - C. K. Schwartz, W. A. Baker, Jr.; B. Fire Clays - A. S. Watts, H. G. Schurecht, C. K. Schwartz et al.

12. Volume 12 (1928) 336p. A. Folding Sands - David W. Trainor, Jr.; B. Notes on Feldspar, Quartz, Chrome and Manganese - J. T. Singewald, Jr.; C. The Serpentines of Harford County - Albert Johannsen; D. The Gabbros of Harford County - Herbert Insley.

13. "Physical Features of Maryland" (Special of Volume VI) W. B. Clark, E. B. Mathews 1906.

14. "Baltimore County" A. Physical Features - E. W. Berry; B. Physiography - E. B. Knopf; C. Geology of the Crystalline Rocks - A. I. Jonas, E. B. Knopf; D. Geology of the Coastal Plain - E. W. Berry; E. Mineral Resources - E. B. Mathews, E. H. Watson; F. Soils - Carter, Snyder, Bruce; G. Climate - Roscoe Nunn; H. Magnetic Work - L. A. Bauer; I. Forest - F. W. Besley.

OTHER PUBLICATIONS

J. 1. "Guidebook to Baltimore - Part 2" The Geology of Baltimore by G. H. Williams for the American Institute of Mining Engineers 1892.

2. The Pegmatites of Maryland - E. H. Watson - Dissertation PhD. J.H.U. 1929

3. The Rocks of Ilchester - William H. Hobbs May 1888 Dissertation Ph.D. J.H.U.

4. The Basic Rocks of Northeastern Maryland by Arthur Gray Leonard May 4, 1898 Dissertation Ph.D. J.H.U.

5. Structure of the Gabbro Complex at Baltimore by Charles J. Cohen May 1934 Dissertation Ph.D. J.H.U.

6. Gabbros and Associated Horneblende Rocks Occurring in the neighborhood of Baltimore by G. H. Williams, U.S.G.S. Bulletin #28, 1886

7. A Glossary of the Mining and Mineral Industry by Albert H. Fay Bureau of Mines, Bulletin #95 Washington 1920.

8. Dana's Textbook of Mineralogy - Fourth Edition by W. E. Ford, John Wiley and Sons, N. Y. C. 1932.

9. Introduction to the Study of Rocks and Minerals, Austin F. Rogers - Second Edition McGraw Hill N.Y.C. 1921

10. Microscopic Determination of the Nonopaque Minerals by E. H. Larsen and H. Berman, U.S.D.I.-Geological Survey Bull. 848 Washington 1934.

11. Microscopic Determination of the Ore Minerals by M. N. Short, U.S.D.I. Geological Survey Bulletin 824, Washington 1931

12. Publications of the New York State Museum including Guidebook for Allegany State Park, N.Y.

13. Dana's System of Mineralogy (J. D. Dana) Sixth Edition by E. S. Dana 1892 John Wiley and Sons.

14. Manual of Mineralogy and Petrography J. D. Dana 12th Edition 1898

15. Useful Minerals of the United States by Shrader, Stone and Sanford U.S.D.I. - U.S.G.S. Bulletin 624, Washington 1917.

16. Structure of the Gneiss Domes near Baltimore, Maryland by Carl H. Broedel May 1935 Dissertation Ph.D. J.H.U.

17. Field Geology by Frederick H. Lahee, Third Edition, Second Impression McGraw Hill, N.Y.C. 1931

18. An Outline of the Principles of Geology by Richard M. Field Barnes and Noble Inc. 1934

19. Mineralogy of Maryland by E. V. Shannon-manuscript M.G.S. through W. E. Price, Natural History Society of Maryland.

20. General Relations of the Granitic Rocks of the Middle Atlantic Piedmont Plateau by G. H. Williams U.S.G.S. 15th Annual Report 1895 pp. 651-740.

21. Origin and Relations of Central Maryland Granites by Charles Rollin Keyes U.S.G.S. 15th Annual Report 1895.

MISCELLANEOUS

K. 1. "The Patapsco", a poem by Charles Soran, Enoch Pratt Free Library Md. CA 2887..83.

2. Literary and Historical Atlas of North and South America by J. G. Bartholomew Everyman's Library E. P. Dutton and Co.

3. Maryland State Board of Forestry Report 1912-1913

4. ditto 1914-1915

5. ditto 1916-1917

6. ditto 1918-1919

7. The Forests of Maryland - F. W. Besley Baltimore December 1916 - Maryland State Board of Forestry.

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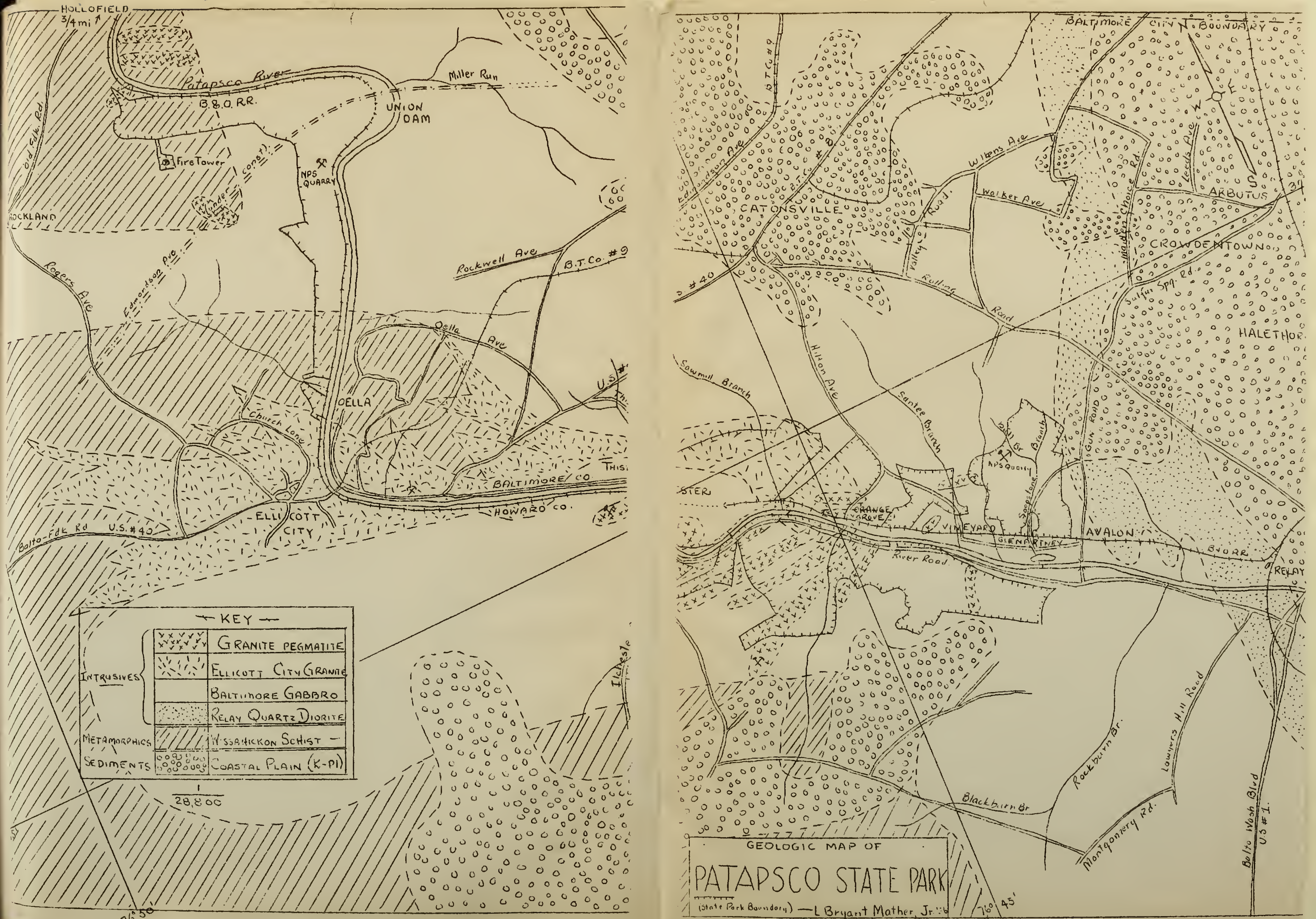
GEOLOGIC MAP OF
PATAPSCO STATE PARK
(State Park Boundary)
— L Bryant Mather, Jr.
KEY
Intrusives
Granite pegmatite
Ellicott City Granite
Baltimore Gabbro
Relay Quartz Diorite
Metamorphics
Wissahickon Schist
Sediments
Coastal Plain (K-Pl)
1/28,800
HOLLOFIELD 3/4 mi
Old Fdk Rd
Patapsco River
B.&O. RR.
Miller Run
UNION DAM
Fire Tower
NPS QUARRY
ROCKLAND
Rogers Ave
Edmondson Ave
Rockwell Ave
B.T.Co. #9
Oella Ave
OELLA
Church Lane
U.S. #40
BALTIMORE CO.
HOWARD CO.
ELLICOTT CITY
Balto-Fdk Rd U.S. #40
Ilchester
76° 50'
BALTIMORE CITY BOUNDARY
B.T.Co. #8
Edmondson Ave
CATONSVILLE
U.S. #40
Wilkens Ave
Walker Ave
Valley Road
Rolling Road
Maiden Choice Rd
Leeds Ave
ARBUTUS
CROWDENTOWN
Sulfur Spg Rd
HALETHORPE
Sawmill Branch
Hilton Ave
Santee Branch
Gun Road
Bull Br Branch
NPS Quarry
Soapstone
ORANGE GROVE
VINEYARD
GLEN ARTNEY
AVALON
B.&O. RR.
RELAY
River Road
Rockburn Br.
Lawyers Hill Road
Blackburn Br
Montgomery Rd
Balto Wash Blvd U.S. #1
76° 45'

Museum of Maryland Natural History—Druid Hill Park

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THE NATURAL HISTORY SOCIETY
OF MARYLAND

PROCEEDING NO. 6

THE HUGHES SITE
AN ABORIGINAL VILLAGE SITE ON THE POTOMAC RIVER IN MONTGOMERY COUNTY, MARYLAND

BY
RICHARD E. STEARNS
CURATOR, DEPARTMENT OF ARCHAEOLOGY

BALTIMORE, MARYLAND
JANUARY, 1940

SMITHSONIAN INSTITUTION
MAR 25 1940
NATIONAL MUSEUM

THE HUGHES SITE

An Aboriginal Village Site on the Potomac River in Montgomery County, Maryland

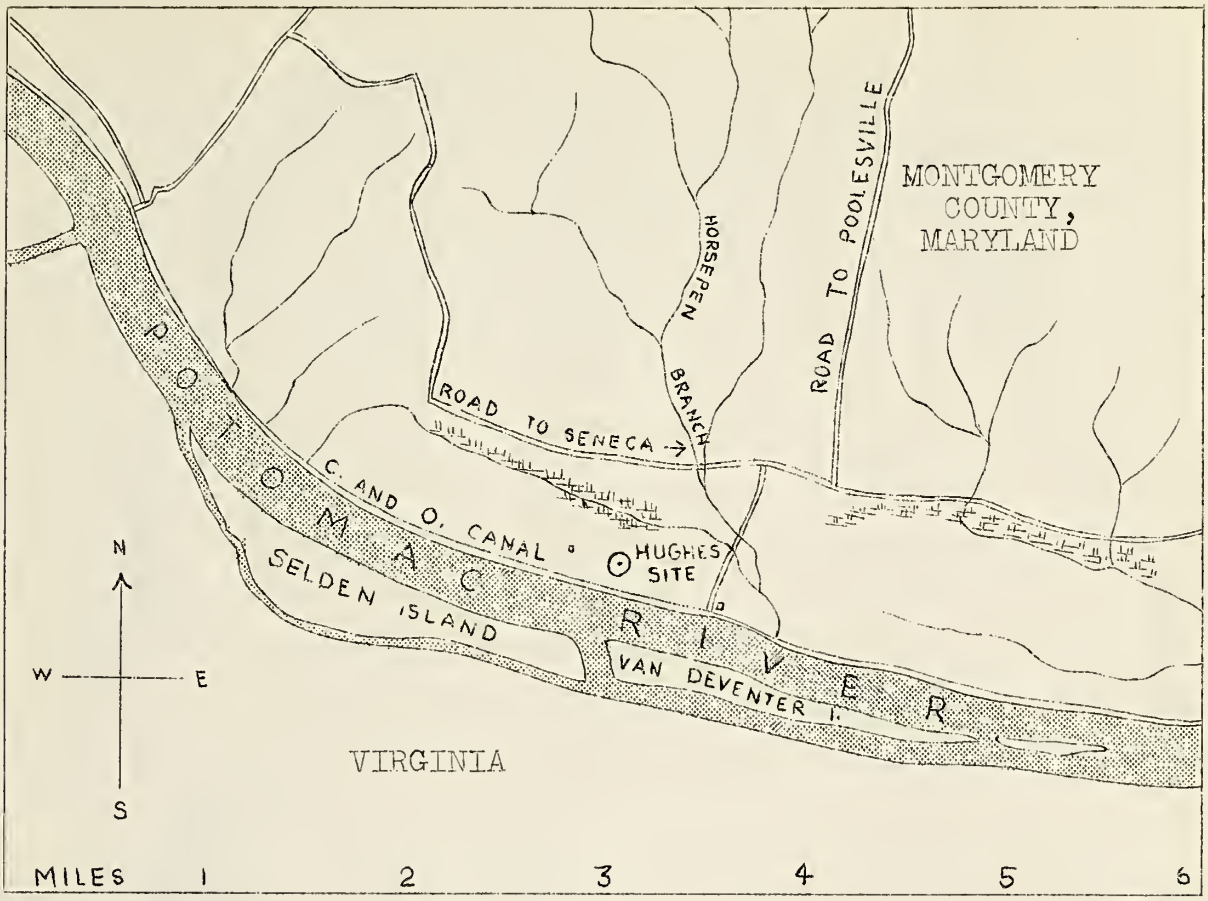
By Richard E. Stearns

Curator of the Department of Archaeology

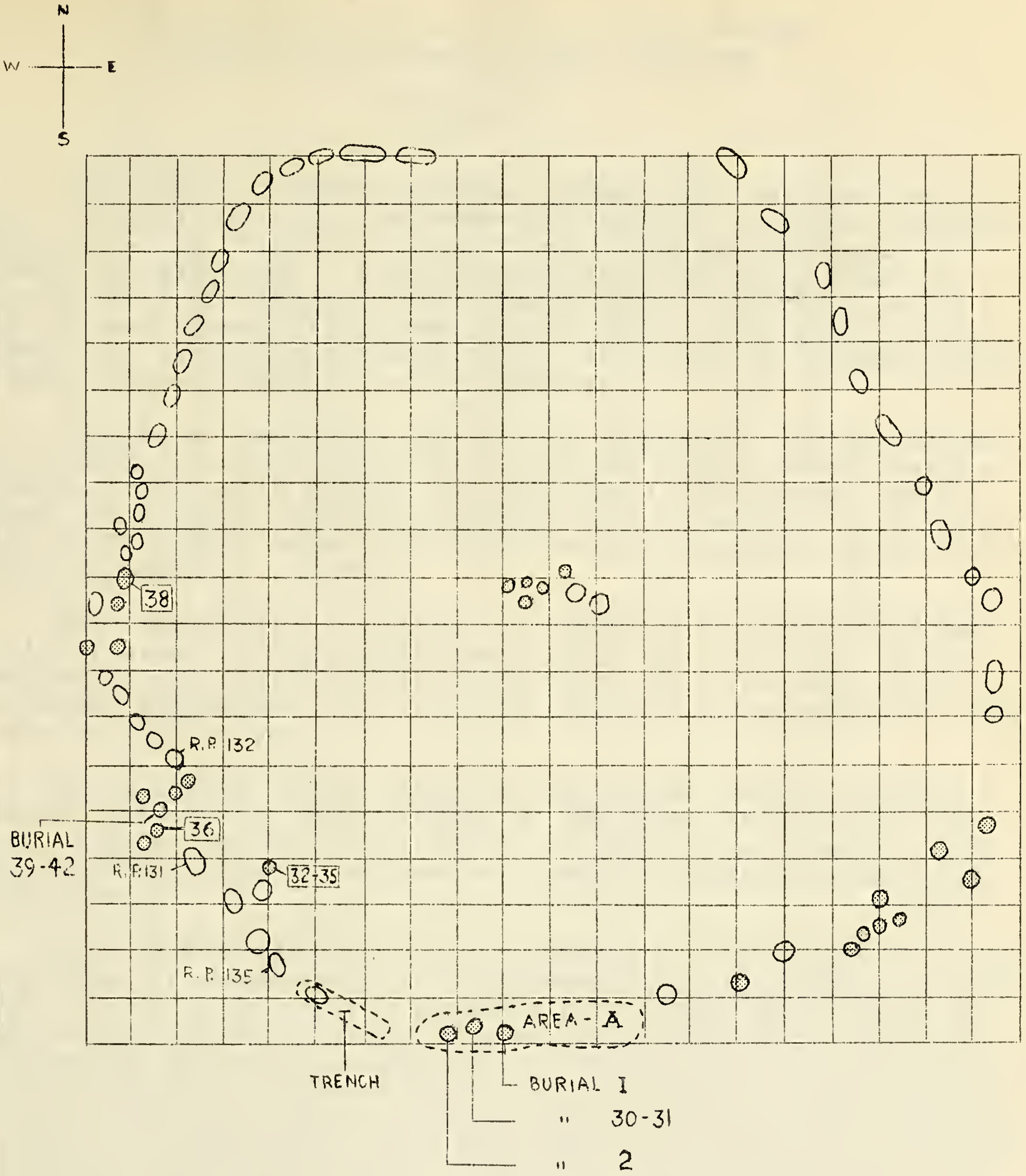
Proceeding No. 6

The Natural History Society
of Maryland
Baltimore, Maryland

506.73
.N317



MAP SHOWING LOCATION
OF HUGHES SITE



PLAN OF INDIAN VILLAGE
F.J. HUGHES FARM, MONTGOMERY COUNTY, MARYLAND

Scale 1:844 - Each section equals 20 feet.
T. Eckert, Surveyor

LEGEND

● Graves ○ Refuse Pits

THE HUGHES SITE

An Aboriginal Village Site on the Potomac River in Montgomery County, Maryland

Introduction

This very interesting Indian village site was discovered in the spring of 1937, on the lands of Frederick Hughes of Washington, D. C., by Nicholas and Roy Yinger, who are residents of Frederick, Maryland. It is located about six miles south of Poolesville, Montgomery County, Maryland, on the north bank of the Potomac River, within two hundred feet of the old C. & O. Canal, and about three-quarters of a mile west of Horsepen Branch, a small stream flowing into the Potomac.

The field upon which the site is located is bounded on the south by the C. & O. Canal and on the north by a swamp that is drained by Horsepen Branch. At this point the Potomac has a flood plain about one-half mile wide that is subject to inundation at very high water, the field being covered at times to a depth of eight or ten feet.

When the Yinger's located the village site, the field was entirely clear of vegetation and a faint semi-circular line of dark earth was visible, which they found upon investigation to be graves and refuse pits that had remained undiscovered through years of cultivation.

Mr. Nicholas Yinger obtained permission from Mr. Hughes' father, who at that time resided on the farm, to excavate the site, and by the end of the summer of 1937 he had opened a number of refuse pits and a group of graves containing twenty-six skeletons.

This find was brought to our attention - the members of the Department of Archaeology of the Natural History Society of Maryland - by an article which appeared in the Baltimore Sunday Sun sometime in August of 1937. A short time later Mr. Frederick Saffran and the writer visited Mr. Yinger for the purpose of seeing the objects and skulls which he had found. We were invited to visit the site, and on arriving there found an area measuring roughly one hundred feet by twenty feet which contained a number of partly filled excavations. This was the cemetery where the twenty-six skeletons had been found and where a few other graves discovered later increased the total number to 31. The earth in this area was very dark from the abundance of ashes in the refuse pits, into which most of the burials had been placed. Scattered throughout the disturbed earth on the surface was a great amount of animal bones with some sherds and fragments of human bone. Mr. Yinger's earlier observation of the semi-circular direction of the line of dark earth led him to believe that the graves and refuse pits had been arranged in a circle. This belief was found to be correct.

As his intention was to completely excavate the site and sell the objects found, we decided to make some arrangement whereby we could watch the work as it progressed, survey the graves and pits, and photograph the burials. We were permitted to do so

MAR 21 1940

on consideration that the burials we uncovered would be purchased.

We therefore visited the site at intervals on week ends from January to June of 1938, at which time Mr. Yinger discontinued work as he thought the site was exhausted. During these visits we opened three graves and photographed them together with two that were excavated by Mr. Yinger and one by the Maryland Academy of Sciences. As most of our time was occupied with the survey, which was supervised by Mr. Theodore Eckert, we ourselves had little chance to dig, though we cleared out two refuse pits and dug a trench through and beyond one that had been previously excavated. The graves and pits which had been cleared in the interval of our visits were also examined and a number of objects, sherds, and animal bones were collected through additional digging in places that had not been completely excavated. We made no attempt to clear an area large enough to expose post holes of a palisade or houses as we had not time enough at our disposal., However, the condition of the soil is such that traces of post holes should be easily detected. The members of the Natural History Society who helped in this work were Mr. Frederick Saffran, Mr. Theodore Eckert, Mr. George H. Stearns and Mrs. R. E. Stearns. Some of the objects and skeletons recovered have been given to the United States National Museum.

Descriptions of the Graves and Refuse Pits

As previously mentioned most of our working time at the site was used in making a survey of the excavations, which consisted of a number of separate pits and a large area that had been worked over to such an extent that it was impossible to do much more than survey its outline. This is the area that was being worked when we first visited the site and is shown in dotted lines and marked on the "Plan of Indian Village" as Area A.

As indicated on the plan the pits were placed in an irregular circle with an open space at the north measuring one hundred and twenty feet across. Testing revealed no graves or pits in this space. The line of dark earth observed when the site was first discovered extended along the western side of the circle, terminating on the south at Area A. When Mr. Yinger first started to dig he chose an area on the western side of the site and discovered a number of refuse pits but no graves. We did not survey these diggings as they were nearly obliterated at the time we saw them, but they were slightly to the east of the group of burials containing skeletons Numbers 39 to 42.

The next place chosen for excavation was Area A on the south, which was found to contain a total of thirty-one skeletons. As some of these were multiple burials we do not know how many actual graves were there. The position of three graves in this group can be recorded however, marked as follows - Burial 1, Burial 2, and Burial 30-31.

Burial 1 contained the skeleton of a young person, the same that was used to illustrate the story that appeared in the Baltimore Sun, and Burial 2 contained at a depth of three and one-half

feet the skeleton of an adult male lying on the right side in a flexed position. In examining Burial 2, a small triangular black stone object was found which is shown in the drawing (Fig. 15). This has flat sides and is slightly pitted on both surfaces as if marked for perforation. So far as we could ascertain no other objects were found in either of these graves. Burial 30-31 was a double internment at a depth of two feet six inches of a youth of about fifteen years of age and a child of six (Plate 1, Fig. 1). A little more than a dozen shell beads were lying in the earth about the right wrist of the youth. About half were small flat beads made from fresh water mussel shell and the remainder were small marginellas.

The earth within the limits of this group of burials was greatly mixed with ashes and refuse, and a great number of sherds and artifacts had been found by Mr. Yinger. By digging in various places to undisturbed clay we found that the depth of this deposit averaged eighteen inches in the areas between the graves. The graves were usually about two and one-half to four feet deep, except those of several infants that were closer to the surface. In comparison with the other graves and pits in the site, Area A showed much more evidence of occupation, the deposit of dark ash laden earth being slightly deeper and containing more refuse and artifacts. In digging in an undisturbed part of this deposit a few feet to the north of Burial 30-31 the writer found, in a space measuring four by six feet, one splinter awl, one deer scapula awl, pierced for suspension, one small bone punch, blunt at both ends, and a pipe stem of clay, decorated with dotted lines apparently applied with a roulette. A number of sherds and animal bones were also found.

Directly to the east of Burial 2 and at a depth of approximately eighteen inches, the writer found in fragments the clay vessel shown in the lower right hand corner of Plate 2, Fig. 1. Twenty feet further east a number of sherds, animal bones, and a stone celt were found in an undisturbed portion of a refuse pit that was about two feet in depth.

After clearing out Area A, Mr. Yinger turned his attention again to the western half of the site, working from the cemetery around to the north, digging test pits at intervals of three or four feet and excavating the refuse pits and graves as they were found. At this time we did some digging ourselves, opening several graves and refuse pits which will be described in detail.

Forty feet to the west of Area A was a pit that had been partially excavated. Through this pit we ran a trench six feet wide for a distance of forty feet toward Area A. The pit was found to be consideraly larger than the original excavation, being trough-shaped and measuring about ten feet long by five feet wide, with a depth of two and one-half feet at its deepest point. The remainder of the trench was cut through an area barren of pits, but having a cultural layer of dark earth about one foot thick under six inches of topsoil. A few sherds, animal bones, and two broken beaming tools were found in this layer. No post molds were seen. The contents of the pit itself were very interesting and a chart has been prepared showing the approximate position of the various objects (Fig.17). A list of

the objects recovered is as follows:

305 body shords
36 rim shords, 4 having lug handles
3 small triangular white quartz arrowpoints
1 fragment of a large quartzite arrowpoint or knife
7 fragmentary beaming tools
1 broken clay pipe (Plate 3, Fig. 1-j)
1 splinter awl
1 antler arrowpoint
2 blunt objects made of the ulna of a deer, one unfinished
1 broken awl made from a deer scapula
1 stone celt (Plate 5, Fig. 2-i)
Numerous animal bones

Lying on the bottom of the pit were two large fragments of a clay pot, one above the other, and at a distance of about three feet were two more large fragments. A deer skull rested on these last two fragments and on the skull lay the broken half of a beaming tool. A few feet further away the other half of this beaming tool was found. This is the lower specimen in Plate 4, Fig. 1. The four large shords were all from the same pot and seemed to comprise the entire vessel, but were poorly fired and came apart in flakes when we attempted to remove them. The bottom of the vessel especially, was in little better condition than plain mud. We also found in this pit a stone tempered rim shord with a heavy collar decorated with parallel cord impressions. This is shown in Plate 3, Fig. 1-c, and is the only rim shord of this type that was found in the entire site, although several body shords, apparently of this type of ware were recovered.

About six feet to the north of this pit Mr. Yinger found what was probably a filled in storage pit, as the earth within it was but slightly discolored. A few shords were present in the soil and at a depth of three feet was a complete beaming tool made from the front leg bone of a deer. This specimen is the third from the top in Plate 4, Fig. 1.

Pit 135*

This pit, ten feet beyond the one in the trench, was partially excavated by us, and was finished by Mr. Yinger during our absence. We are not certain as to its dimensions, but it was also trough-shaped and at least ten feet long and very rich in artifacts. The center was a compact mass of black wood ash, plentifully mixed with animal bones and shords. Below is a list of the artifacts recovered by us:

125 body shords
16 rim shords, 1 with lug handle
3 small quartz triangular arrowpoints
1 large broken rhyolite triangular arrowpoint
1 antler arrowpoint
2 broken halves of beaming tools
3 splinter awls
Animal Bones

Foot note
*This number was given to this pit by Mr. Yinger, but it is certain that there are not this many pits in the entire site; however, we have listed our collection according to his numbers and do not think it wise to change them.

Pit 131

This was a large but shallow pit not extending down more than two feet from the surface. The dimensions of the excavation were about fourteen by ten feet. Mr. Yinger cleared this pit and found the following objects:

130 body shords
14 rim shords, 3 with lug handles
1 fragment of a beaming tool
Animal bones

Pit 132

This was a bowl-shaped pit about five feet in diameter and three feet deep in the center. The contents were as follows:

107 body shords
14 rim shords, 1 with lug handle
4 small triangular quartz arrowpoints
2 broken beaming tools
1 splinter awl of bone (Plate 4, Fig. 2-F)
1 antler arrowpoint
Animal bones

This pit contained much wood ash and the cultural objects had been thrown in indiscriminately. This condition seemed to apply to all the pits.

Burials 32-35

This grave contained the skeletons of four individuals at a depth of about four feet. By the time we arrived at the site on the morning that Mr. Yinger opened the grave, all the bones with the exception of three skulls had been removed. Two of the skulls were lying in such a position that they obviously represented a secondary burial. The other skull was separated from these two by about five feet, and as the neck bones were still in their proper place this was probably a flexed burial. Details concerning the other skull are not known. According to Mr. Yinger no objects were found with these skeletons.

Burial 36

This was the tightly flexed skeleton of an adult male, at a depth of three feet, lying on the right side, and was removed by members of the Section of Archaeology of the Maryland Academy of Sciences. No objects were found with this burial other than some shords in the grave earth.

Burials 39-42

This grave contained a secondary burial of three individuals and the flexed skeleton of a child lying beside them. Scattered through these bones were a few fragments of cremated burial, consisting of parts of a skull and some bits of long bones. Amongst the bones of the secondary burial was a pendant made of the baculum or penis bone of a raccoon. The secondary burial is shown in Plate 1, Fig. 2, with the crushed skull of the child uncovered.

After removing the secondary burials the child's skeleton was then exposed and was found to be lying on its back with the legs partly flexed and turned to the right.

Burial 38

This burial was that of an adult female at a depth of nearly four feet. A string of shell beads extended from the neck to the hips. These were of the same type as the long string shown in Plate 3, Fig. 2. The left humerus, left clavicle, and some of the neck bones with a part of the base of the skull were missing.

Ten feet south of Burial 38 was the grave of a white man lying extended on the back at a depth of about six feet. We completely uncovered this skeleton and found nothing but a few T-headed iron nails near the skull. After photographing the skull for identification, we recovered the skeleton. Mr. Yinger opened and examined two burials, which also seemed to be those of white persons fifteen feet south of this one. The remains of a wooden coffin were still preserved in one. These people may have been early settlers; at any rate, the fact that they were buried in this spot is very interesting. These white burials, although within the area of the refuse pits were not placed in any of them. These were the only burials containing the skeletons of white persons.

Directly in the center of this circle of pits Mr. Yinger found five graves containing seven Indian skeletons. Nearby were two pits filled with wood ash and refuse.

Personal ornaments were all that were found in association with the Indian burials, which contained approximately seventy individuals. These included shell and bone beads, and bone and oyster shell pendants. A few sherds and animal bones were found in some of the graves, but as a number of burials were in refuse pits, their presence was probably accidental.

After finishing the western side of the site, Mr. Yinger began working the eastern side and discovered many more graves and pits. While this side was being worked we were attending to the survey and consequently, having little time to dig ourselves, we merely examined the work done by Mr. Yinger.

One fact was noticeable in regard to the pits, - a number of them were trough-shaped with the longest dimension parallel to the circumference of the circular plan of the village. (See Plan of Village). We do not know whether all of these pits, other than the graves, were refuse pits or whether some were fireplaces. All of them contained quantities of ashes, and produced sherds, artifacts and animal bones. A small proportion of the animal bone showed traces of fire, yet, if the pits were fireplaces, it would seem to the writer that many more bones should show the effects of long continued fires. In view of the fact that we did no testing for post molds, it is also not known whether the pits were inside or outside houses.

During the course of our excavations we found no objects of European contact, and Mr. Yinger said that he had found none.

Regarding the three white burials previously mentioned, it is possible that they may have some connection with the site. On the other hand, as no objects of Indian manufacture were found with them, their location may be entirely fortuitous.

Pottery

Through purchase from Mr. Yinger and the result of our own work we secured approximately ten thousand sherds from the Hughes site. From all these sherds it was possible to restore only four vessels. These are shown in Plate 2, Fig. 1. The three larger pots were typical of the ceramic style used at this site. They are wide mouthed, round bottomed vessels with cord impressions on the exteriors, and are further embellished with notched rims and two oppositely placed lug handles. Approximately ten per cent of all the sherds recovered had some form of decoration besides handles and notched rims. The notches on the rims were probably applied with the same cord wrapped paddle used to impress the outer surface of the pot, and in a number of instances, after being applied they had been partly obliterated by smoothing down the rim. In some specimens a smooth object, which left no cord impressions, had been used to make the notches. The various forms of lug handles and rim notches are shown in Plate 2, Fig. 2, and by a page of drawings. Two sherds were found that had decorations on the rim consisting of holes punched in with some hollow object such as a small reed or bird bone. One of these is shown by a drawing (Fig. 2).

It was observed that the impressions on the outer surface of the sherds were those of cords only; net and woven fabric impressions were entirely absent. It was further observed that the cord markings in nearly all specimens had been partially smoothed down, and in a few cases entirely obliterated. Only a few sherds were found that had not been smoothed at all and one of these is the fragment used in making the largest restored pot shown in Plate 2, Fig. 1. The color of the ware is brown, of various shades, from light buff to a very dark brown, and exhibits the usual mottled coloring common to Woodland pottery, caused by uneven firing.

The interiors of some vessels had a smooth black finish, which does not seem to be a slip, as it penetrates into the clay. It was probably produced by burning the pot upside down, cutting off the circulation of air in the interior and causing the inside to become black.

The tempering material consists in the main of the crushed shell of a species of fresh water mussel that to this day is found in the Potomac River. We have seen a number of shells of this mussel that had been gathered at Point of Rocks. The shell was never mixed with the clay in excessive amounts nor in extremely large particles. A very few exceptions were found to this form of tempering material, several sherds containing a fine sandy grit mixed with the clay.

It is more than likely that the vessels were built up by coiling, but the sherds show little evidence of this method since with few exceptions the fracture lines run in all directions. This

condition was probably due to the fact that the vessels were quite well made. The drawings (Fig. 11) show two circular disks of shell-tempered clay that are the bottom pieces of pots, and these show evidence of coiling very plainly. There are several more of these disks in the collection together with other shords from the bottom of pots which do not at all show evidence of coiling.

Concerning the fact that only two lug handles were used on these pots, the writer advances the following reasons. In the first place, no more than two handles were found in any part of the site that matched in shape, size, composition of clay and decorative technique. Furthermore, several large sherds in the collection contain enough of the rim to pass the half way mark between two oppositely placed handles without showing additional ones. The restored vessel in the lower right hand corner of Plate 2, Fig. 1, has its two original handles and shows no signs of possessing others. These handles are not so prominent as some others and consequently do not show up well in the illustration. Moreover, the crushed vessel that was found in the trench contains only two handles.

Some of the knob-like handles on the small to medium-size vessels were pierced for suspension, the holes, never larger than one-quarter inch in diameter, having been punched through the clay while it was still plastic. The handle on one pot was formed by extending the rim outward somewhat like the lip of a modern water pitcher. A decoration in the form of a double triangle of punched dots was placed on the handle facing the inside of the vessel. (Drawing, Fig. 1).

In size these vessels ranged from about four or five inches in height to very large forms, probably as much as eighteen inches in height and diameter, but since we were unable to restore any of the larger ones, these measurements are only approximate. A study of the curvature of the sherds shows that a medium-size vessel was preferred, averaging from eight to ten inches in height and about the same in diameter.

Decorative design, when present, was usually applied to the neck of the vessel just below the rim and consists of patterns formed with punched dots, or trailed lines, and a few examples that were impressed with cord. Certain of the drawings illustrating these designs are unnumbered. They are all shell-tempered with the exception of the sherd directly above Fig. 9.

A design appearing on several vessels consists of a chevron-like mark. This was usually applied just below the rim, but one sherd from a very large pot contains this design nine inches below the rim at the greatest width of the vessel and spaced four inches apart (Drawing, Fig. 3). Another design, observed on only one sherd, consists of groups of finger nail impressions placed at intervals some six inches below the rim of a fairly large pot. (Drawing, Fig. 5).

An interesting design is shown by a drawing (Fig. 4). This was placed about four inches below the rim. That part of the vessel between the rim and design is polished quite smooth while the part

below the design is heavily cord marked. A sherd with a trailed line pattern is shown on Plate 3, Fig. 1-g. A sherd from a small vessel that contains a design composed of a double row of very small punched dots is illustrated by a drawing (Fig. 6). This sherd is very thin, about one-eighth inch, of a rich brown color, and sparsely tempered with very fine particles of shell.

A number of sherds from small cup-like vessels were recovered. The composition of the clay of most of them is very sandy and contains no other tempering material. The few exceptions contain both shell and sand. The color range is from a brick red to dark grey. Cord impressions were not applied to the exterior as on the larger pots, nor did they have lug handles. The sherds are rather thick for such small vessels, some as much as one-half inch at the bottom and one-quarter inch at the rim. The smallest restored vessel shown in Plate 2, Fig. 1, is of this type. It is sand-tempered, dark grey in color and is not decorated. The sherd shown in Plate 3, Fig. 1-a, is also from one of these small cups. It is sand-tempered, brick red in color and has a notched rim with a row of dots punched in below the rim and a chevron design below the dots. The drawing, Fig. 7 shows another sherd that is sand-tempered, light buff in color, with a notched rim and dot decoration. Another buff colored sand-tempered sherd is shown by a drawing, (Fig. 8). This has a notched rim, incised design and chevron-like mark.

The few sherds yet to be described present features that are somewhat different from the usual type of ware used at the Hughes site and although they were probably made there, they seem to suggest outside influence.

Plate 3, Fig. 1-b. This sherd was found in the earth above Burial 38. It is tempered with crushed quartz and bears a crude design of trailed lines. The rim is smooth and without notches.

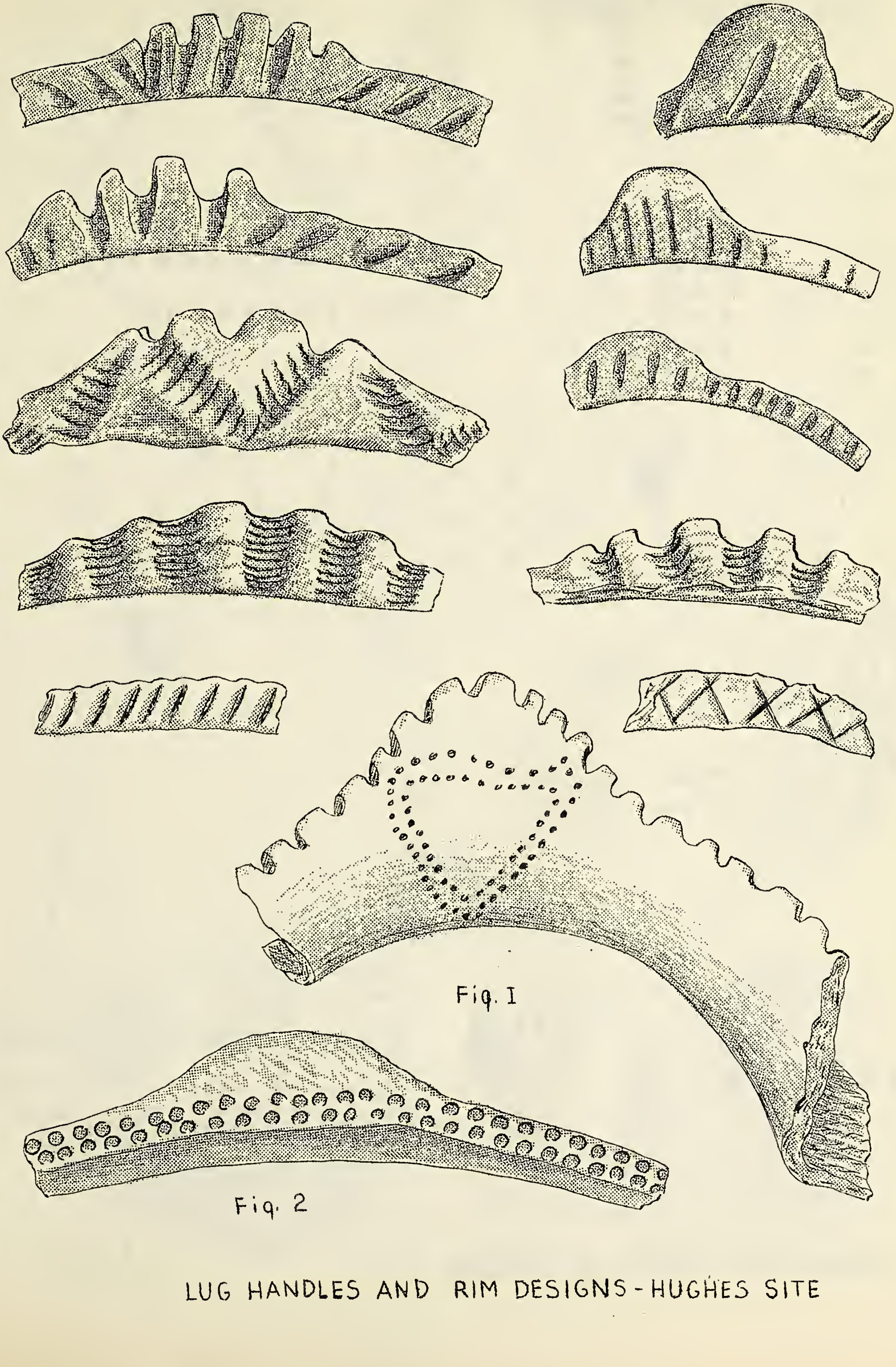
Plate 3, Fig. 1-c. This sherd is tempered with crushed quartz and possesses a thick collar with two parallel cord impressions and indentations at the overhang of the collar. The rim is flat and without notches. These features are common to certain forms of ware occurring at other sites along the Potomac above tidewater and in the Shenandoah Valley. This was the only rim sherd of this type found at the Hughes site.

Plate 3, Fig. 1-d. This sherd is similar to the one just described, but in some respects it resembles the Hughes site ware in that the rim is notched and the composition of the clay, which is shell tempered, resembles that of the local pottery.

Plate 3, Fig. 1-e. This sherd is shell-tempered with a flat smooth rim and bears a design formed by a series of short punches made with a pointed implement.

Plate 3, Fig. 1-f. This rim sherd is similar to Fig. 1-e in treatment, the design being applied in the same manner, but the tempering material is crushed quartz.

Drawing, Fig. 9. This sherd is light buff in color and is tempered with crushed quartz. The design consists of trailed or incised lines and the exterior cord markings have been smoothed



LUG HANDLES AND RIM DESIGNS - HUGHES SITE

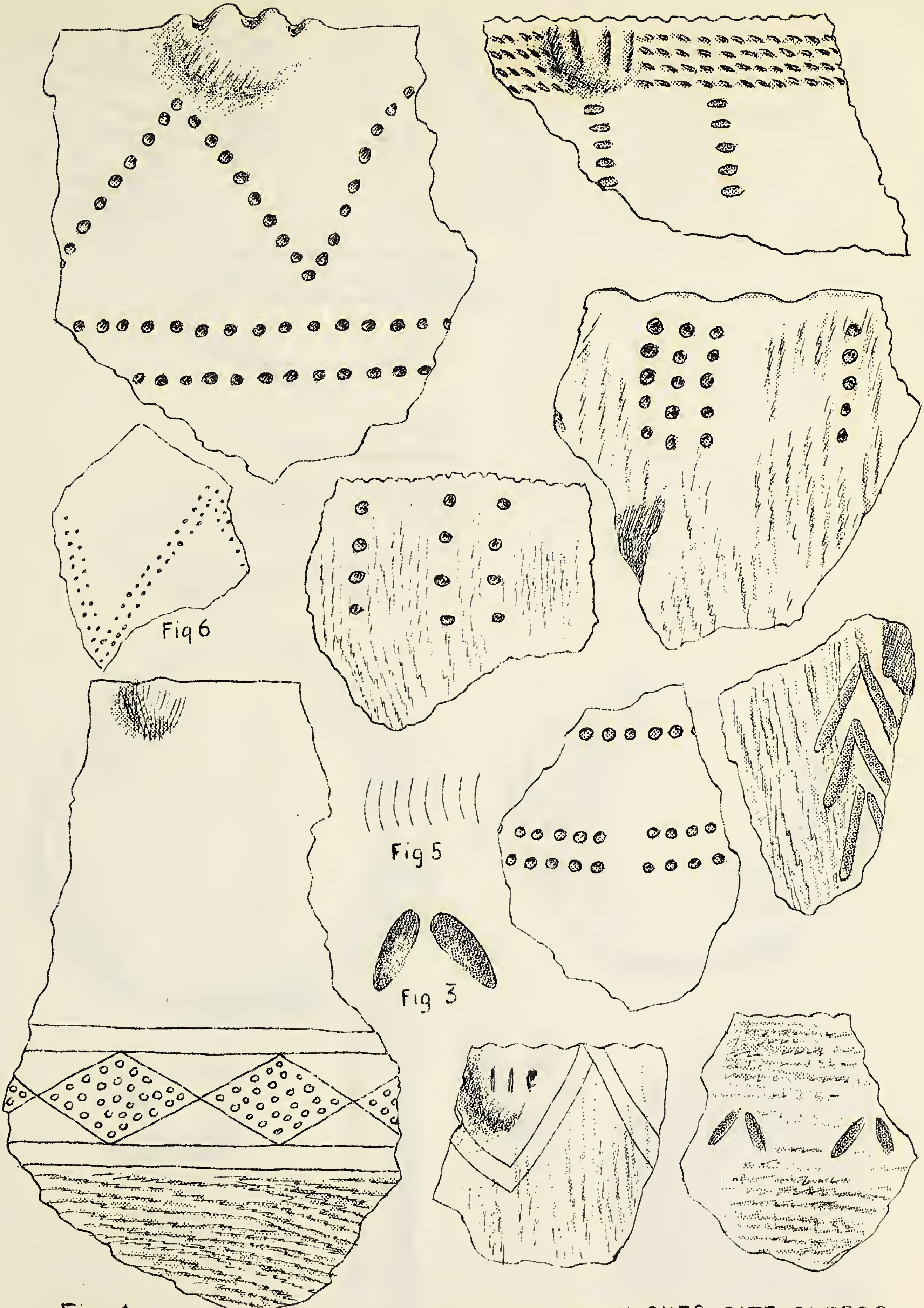


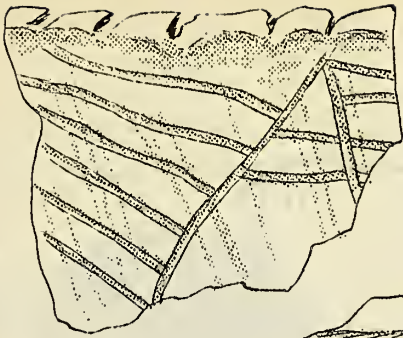
Fig 6

Fig 5

Fig 3

Fig 4

DESIGNS ON HUGHES SITE SHERDS



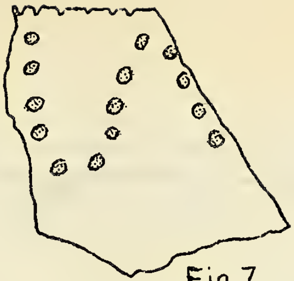


Fig 7

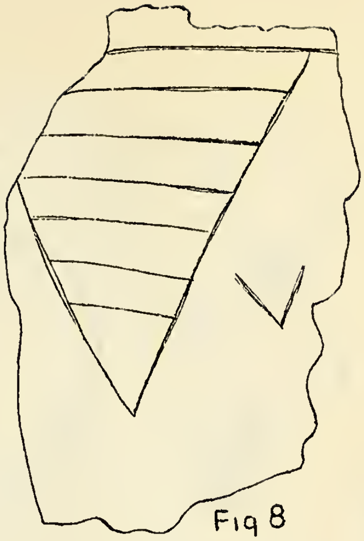
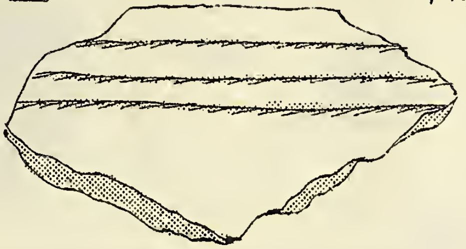


Fig 8



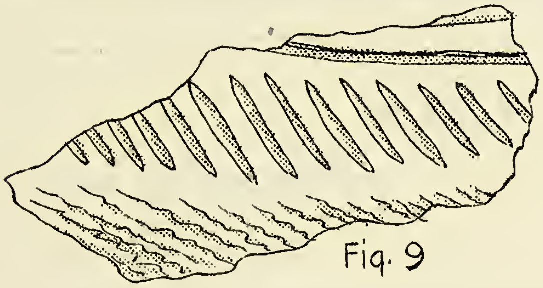


Fig. 9

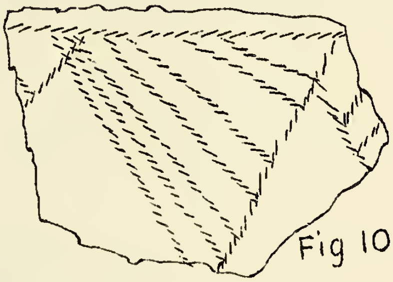
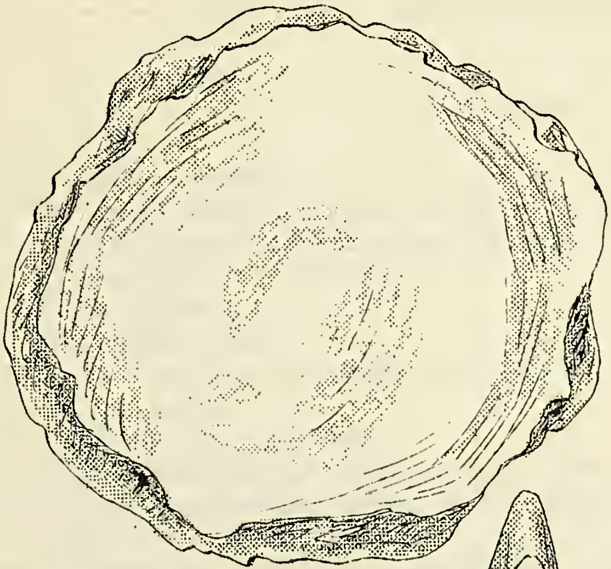


Fig 10



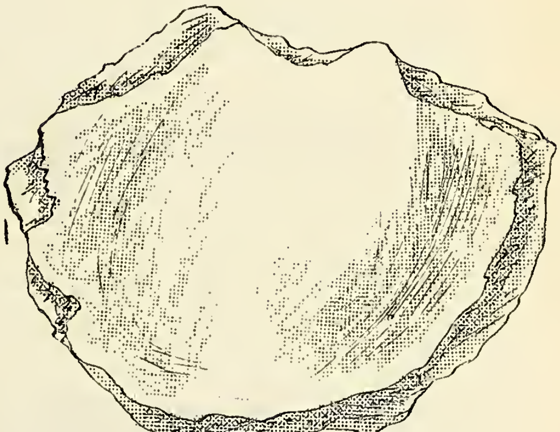


Fig. 11

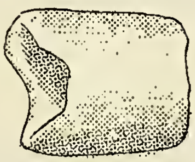


Fig 12

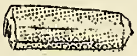


Fig. 13

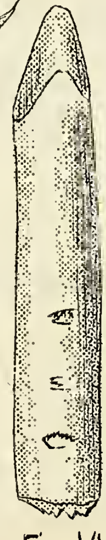


Fig. 14

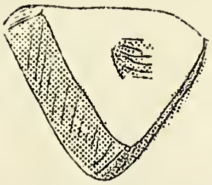


Fig. 15

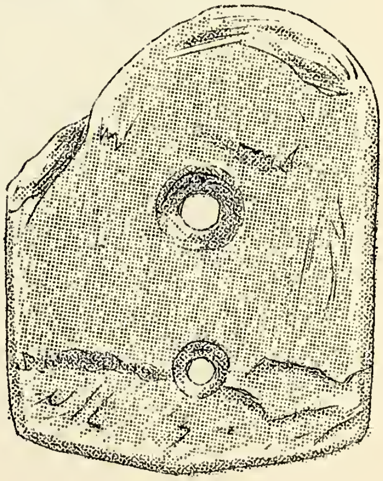


Fig. 16

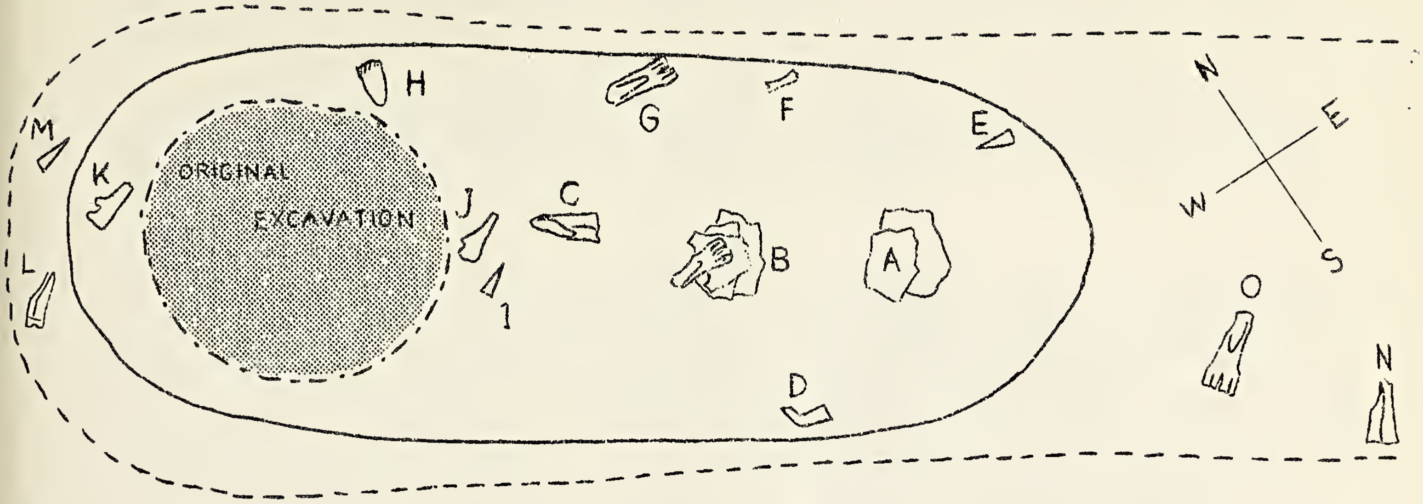


Fig. 17

- - - - - - area of excavation

———— outline of pit

-·-·-·- outline of original excavation

Contents of Pit

A - 2 large sherds
B - broken beaming tool lying on deer skull which in turn was placed upon two large sherds
C - broken beaming tool
D - clay pipe
E - splinter awl
F and G - broken beaming tools
H - stone celt
I - antler arrowpoint
J - blunt implement made from deer ulna (Plate 4, Fig. 2-k)
K - blunt implement made from deer ulna (unfinished)
L - broken beaming tool
M - broken awl made of deer scapula
N and O - broken beaming tools

Position of sherds and arrowpoints are not recorded.

away where the design was placed.

The shord just above Fig. 9 bears a design of three thin parallel cord impressions. The clay is very gritty and grey in color.

Drawing, Fig. 10. This shord is grey in color and very gritty in composition. The design has been applied with thin cords.

Pipes

The general characteristics of the pipes found at the Hughes site can best be noted by examining the four broken specimens shown in Plate 3, Fig. 1-h, i, j, k. All the pipes found are made of clay and contain no tempering materials other than what seems to be natural impurities. The color is either grey or brown. One speciman now belonging to the Maryland Academy of Sciences has a diamond-shaped mouthpiece, similar to those illustrated in the 15th Annual Report of the Bureau of Ethnology, and reported as coming from various parts of tidewater Virginia. However, the usual shape of the stem and mouthpiece of the Hughes site pipes was round. A description of the four pipes illustrated in Plate 3 - Fig. 1 is as follows:

h - A stem of grey, polished, untempered clay containing a design applied with a roulette. Found in Area A.

i - Part of a bowl of grey clay flecked with minute particles of mica. The bowl contains a pleasing design that was applied with a pointed implement.

j - A bowl and part of the stem of a pipe of grey fire-mottled, untempered clay.

k - The stem and base of the bowl of this pipe, which is made of brown untempered clay, is nearly on a straight line.

Objects of Shell

These specimens consist entirely of beads and pendants and were found with skeletons, usually those of women and children. The form of shell bead in principal use was made from the fresh water mussel and is illustrated in Plate 3, Fig. 2, by the longest string and by several loose specimens. Some of these beads are very small and there is also considerable variation in the size of the perforation in relation to the bead as can be seen from the loose specimens in the plate. Some of the perforations are cylindrical and others are beveled on one or both sides of the bead. This string of beads was obtained through purchase, and is made up of parts of several strands found with different skeletons. They are identically the same as the beads found with the skeleton in Burial 38.

A short string of cylindrical beads made from the columella of a small univalve is shown at the bottom of Plate 3, Fig. 2. One bead in this string is made from a species of Dentalium. These we obtained through purchase and have no data concerning them, other

than the fact that they were found with a burial and that the few we have are not as many as were originally found.

We also obtained through purchase the two oyster shell pendants shown in the same plate with the beads, concerning which we have no data except that the smaller of the two was found with Burial 12 (not recorded on Plan), and that both came from the group of burials in Area A. The perforation in the larger specimen is largely the work of the marine shell borer, but has been artificially smoothed on the inner surface of the shell. The perforation in the smaller specimen is entirely artificial.

About a dozen beads, half of which were small marginella shells beveled in the usual manner for stringing were found about the right wrist of the youth in Burial 30-31. These we have been unable to identify.

Bone and Antler Objects

The Hughes site was very prolific in bone implements, with a wide range of types, of which the most notable were fleshers or beaming tools made from the cannon bones of the deer. Seventy-nine specimens are known to have been recovered, of which nine were complete. Nearly all of the broken specimens were fractured in the center, which is the thinnest and weakest part of the implement and none of them matched.

Plate 4, Fig. 1 illustrates four complete specimens, of which two were fashioned from bones of the foreleg and two from the hindleg. Of the total number recovered, about twenty per cent were made from bones of the foreleg, eighty per cent from bones of the hindleg, and one specimen was made from a bone other than a cannon bone.

The most numerous type of implements recovered were awls made from splinters of the leg bones of deer, and from bird and other animal bones. Although we were unable to get an exact figure as to the number found, the writer believes that between one hundred and fifty and two hundred specimens would be about the correct number.

Plate 4, Fig. 2, aside from splinter awls, shows a number of other forms of bone objects, most of which were found by our party. A description of the objects illustrated in this plate, and the number recovered, is as follows:

Plate 4
Fig. 2

A - Awl made from bird bone, three specimens.
B - Deer scapula awl, pierced for suspension. Two broken specimens were also found.
C - Pointed implement made from a piece of flat bone, one specimen.
D - A small implement with a polished, beveled surface at the working end. This surface appears to have been produced by rubbing or polishing, and is slightly reddish in color. The drawing (Fig. 14) shows another view of this implement enlarged about two and one-half times.

The implement originally was longer as it shows unmistakable marks of cutting.

E - Small punch, blunt at both ends, one specimen.
F - Large splinter awl made from deer leg bone.
G - Small implement, blunt at one end, opposite end cut and snapped off.
H - Cutting implement made from a beaver's tooth. Two of these were found.
I - Splinter awl made of deer leg bone.
J - Bone fish hook. Approximately six complete specimens were recovered and two in an unfinished state.
K - This implement is made from the ulna of a deer and is blunt and polished at the working end. One other specimen has the pointed end cut off but has not been polished. No pointed implements of this bone were observed at the Hughes site. Although numbers of deer ulnas were recovered, these two were the only ones that had been fashioned into implements.
L - A pendant made from the baculum or penis bone of a raccoon. This specimen was found amongst the bones of the secondary burial shown in Plate 1, Fig. 2. The holes for suspension have been cut in from the top and side. One other specimen and several unworked bones were recovered.

Several fragments of tortoise carapace were found that had been pierced near the edges, and which bore other signs of working, - for instance scratches and rubbing marks on the back of the shell, showing that the outer plates had been removed.

These carapaces were probably used for rattles or cups and perhaps as pendant ornaments.

We obtained from Mr. Yinger two bone beads, one of which was found with a burial. This specimen is highly polished and is oval in cross section. The hole through this bead is quite large and appears to be the natural hollow in the bone, but has been polished to the same extent as the outside. This bead is illustrated by a full size drawing (Fig. 12).

The other bead is shown by a full size drawing (Fig. 13), and is made from a solid piece of bone. The hole for threading is a little less than one-sixteenth inch in diameter.

The principal use for antler at the Hughes site was in the making of projectile points, of which we obtained ten more or less complete specimens and several fragments. The total number recovered by Mr. Yinger is not known, but there were undoubtedly many more. However, stone projectile points were far more numerous.

Some of the antler projectile points, typical of those used at this site, are shown in Plate 5, Fig. 1. The specimen at

the far right is a perfect and beautifully made point that was found in Refuse Pit 135. The point on the extreme left was made from a piece of antler that seems to have been previously used as a flint working tool. It had been hollowed in the base for insertion of a shaft similar to the rest of the points, but no attempt had been made to smooth down the rough notches caused by flint chipping.

Bones of food animals were abundant in the pits and in the immediate vicinity and consisted principally of the remains of the Virginia deer. Also present in much smaller quantities were the remains of elk, raccoon, fox, beaver, ground hog, muskrat, squirrel, skunk, and there was one mandible of a wild cat. Birds were represented by turkey and several others which we have not yet identified. Tortoise and turtle bones were numerous.

Stone Objects

The most numerous of the stone objects found by our party were projectile points; about three dozen in all. Altogether no less than two hundred were collected by Mr. Yinger, nearly every pit containing at least one. Most of these were small triangular points made of white quartz, several examples of which are shown in Plate 5, Fig. 1. It will be seen that there is one stemmed point shown in the illustration which is made of the same form of white quartz as the others. There were only a few of these found. On Plate 5, Fig. 2, several points are shown that are made of quartzite and rhyolite. The few specimens illustrated are the only ones that were recovered.

Plate 5, Fig. 2, also shows several celts and hammerstones. Eight celts and one small double-ended chisel were found. The material of which they are made is a hard blue-green rock. No grooved axes were unearthed at this site. The hammerstones collected are of the usual types that can be found on nearly any ancient Indian site.

Several irregular pieces of steatite were found which bore the marks of stone chisels. One of these had a very crudely chiseled, shallow cavity worked in on one surface. No objects made of steatite were found other than these.

One small fragment of hard red hematite has two rubbed surfaces and is probably a piece of paint stone.

Two gorgets made of dark purple slate were found by Mr. Yinger. One of these was secured by us and is shown by a drawing (Fig.16).

A description of the objects shown in Plate 5, Fig. 2, is as follows:

a - Spherical hammerstone of quartz.
b - Hammerstone of hard blue-green rock flaked on the ends, pecked on the sides and containing one polished surface as if it had been used as a polishing stone.
c - Drill-shaped arrowpoint of rhyolite.
d - Arrowpoint of quartzite.
e - Broken blade of quartzite found in trench.

f - Broken triangular point of rhyolite from Pit 135.
g - Hammerstone of rough grey rock.
h - Unfinished, broken butt of a celt of blue-green rock.
i and j - Two much used celts of the same type of rock as h.

Conclusion

The excellent condition of the skeletons and implements found at the Hughes site does not seem to indicate any great age for its occupancy. Nevertheless, as there were no objects of European manufacture found, it would seem that the village was occupied before the arrival of the white man. The discovery of the three white skeletons may cast some doubt on this assumption. Unless it can be proven that these white people were settlers of a later period their presence at the site will have to be taken into consideration.

At the period of white contact the Indians living in the Chesapeake Bay area were of Algonkian stock, their territory extending to the falls of the great rivers draining into the Bay. The land lying to the west of the fall line was occupied by tribes speaking a Siouan dialect. This territory included the Shenandoah Valley and the Potomac River above tidewater.

It is true, however, if one may judge by pottery and other artifacts found, that certain village sites to the west of the fall line on the Potomac River were occupied by Algonkians before white contact. These sites of probable Algonkian origin extend as far up river as Van Deventer Island and possibly a bit farther.

There are sites occurring along this stretch of the river that produce pottery of a type that is different from the ware used by the Algonkians. This form of pottery is also found in the Shenandoah Valley. These vessels are tempered with stone and have heavy cord impressed collars at the rims. The type is shown by the single rim sherd that was found at the Hughes site (Plate 3, Fig. 1-c).

Near the headwaters of the Shenandoah and also further south on New River, occurs another form of pottery having loop handles connecting the rim and neck of the vessels. This ware somewhat resembles that from the Hughes site, but although some of the lug handles at the Hughes site are pierced for suspension, none was found that had loop handles resembling those from New River.

The traits that form the culture of the Hughes site are very well defined, since throughout the entire site, the same forms of pottery, stone and bone implements were found, and those objects that seemed to show outside influence were seldom encountered. In discussing the subject of inhumation with Mr. Yinger, we noted particularly that flexed burials, secondary burials, and cremation were all used in disposing of the dead, but cremation was seldom practiced.

It may be said definitely that the pottery and a number of the other artifacts found at the Hughes site do not resemble those of the Chesapeake Bay Algonkians. Certain features of the material culture, such as a well defined bone industry, and the preference

for celts and small triangular arrowpoints, tend to suggest Iroquoian influence. On the other hand the pottery bears little or no resemblance to that attributed to the Iroquois. Pottery distinctly Iroquoian and in no way resembling that from the Hughes site has been discovered in West Virginia on the South Fork of the Potomac River.

Although many encampments and burial grounds have been located in the regions under consideration, it is doubtful if the material culture of any of them except that of the Algonkians and possibly the Iroquois, has as yet been positively identified as belonging to historically known tribes. It will be seen from the foregoing observations that the matter of identifying the Hughes site people should not be attempted until more work has been done in this region. The writer sincerely hopes that the information presented in this proceedings will be of some value to those who are interested in the Archaeology of this area.

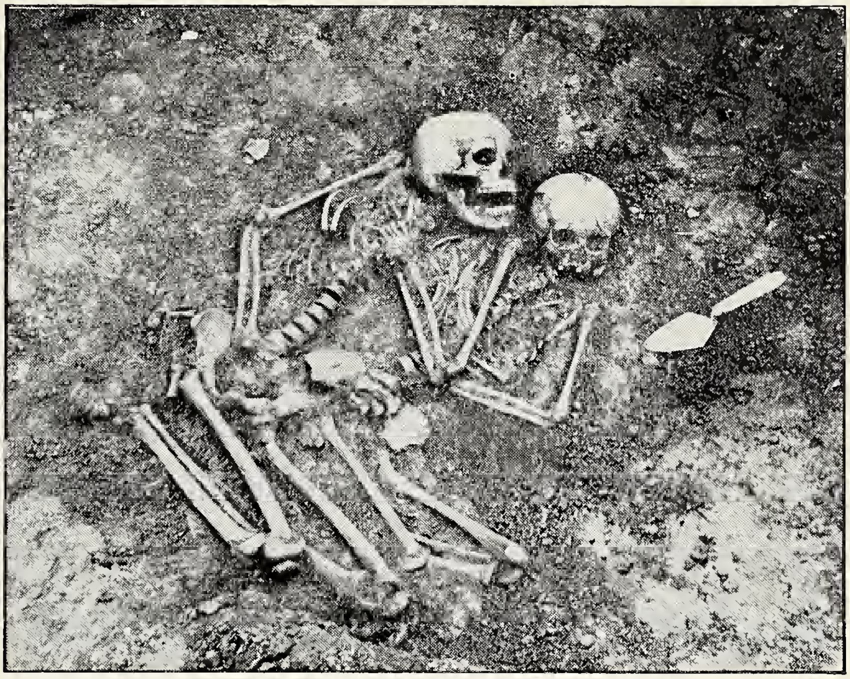


FIG. 1

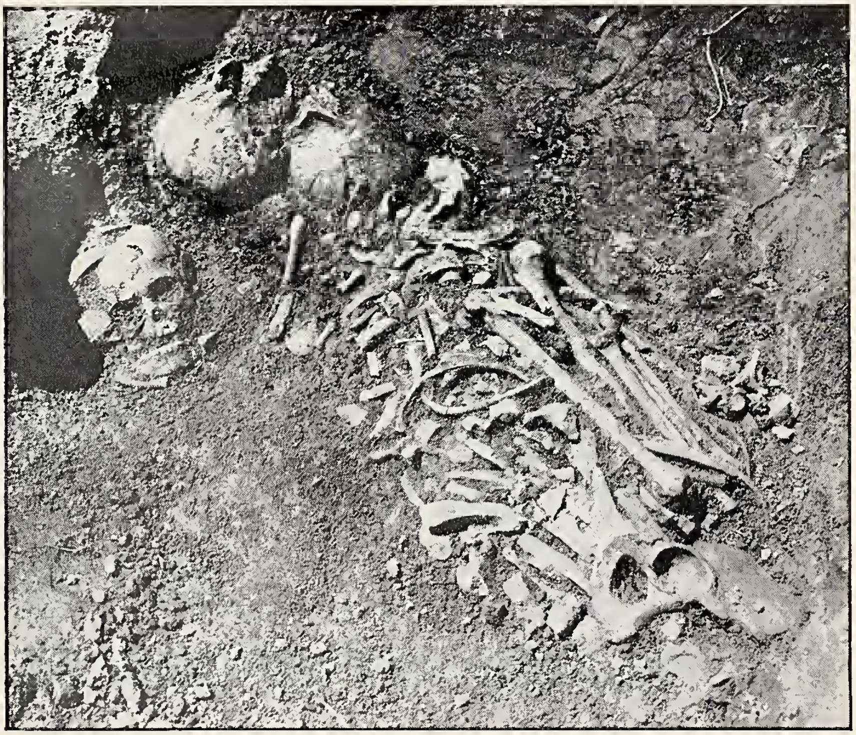


FIG. 2

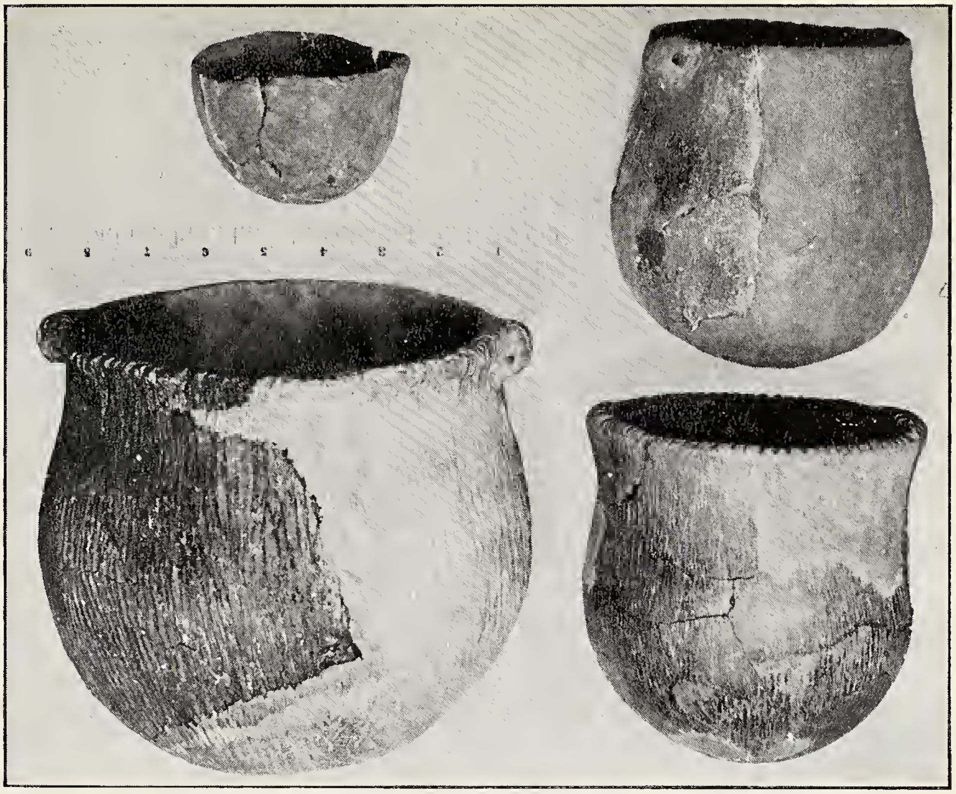
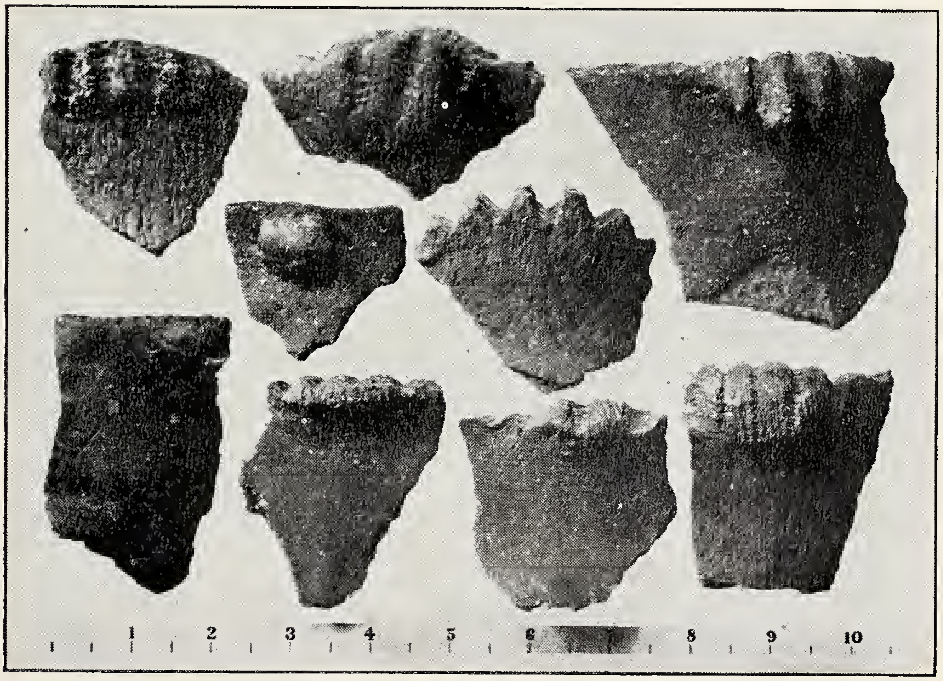


FIG. 1



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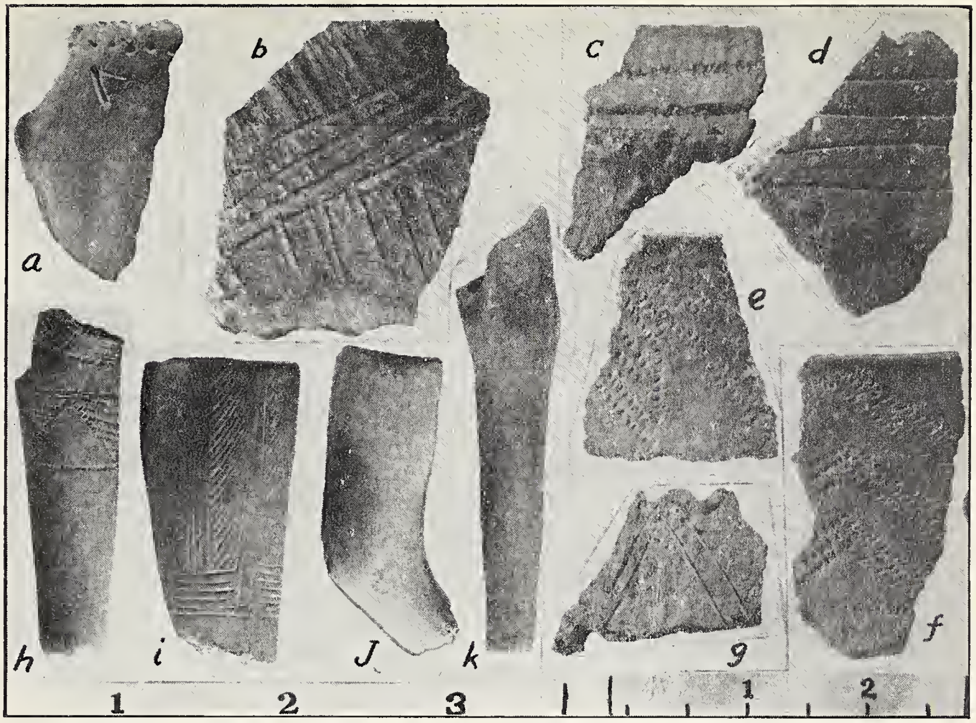

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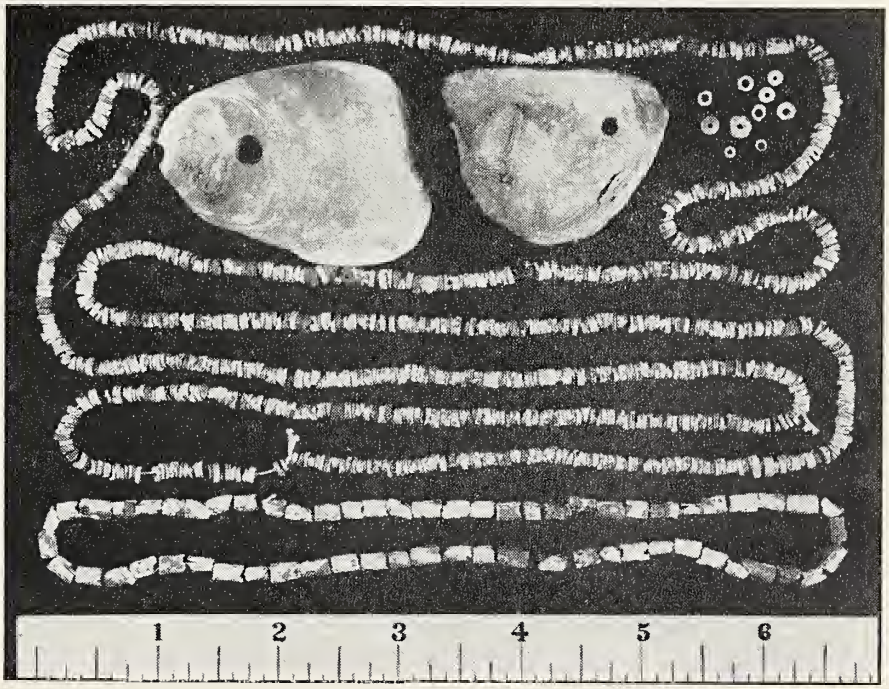

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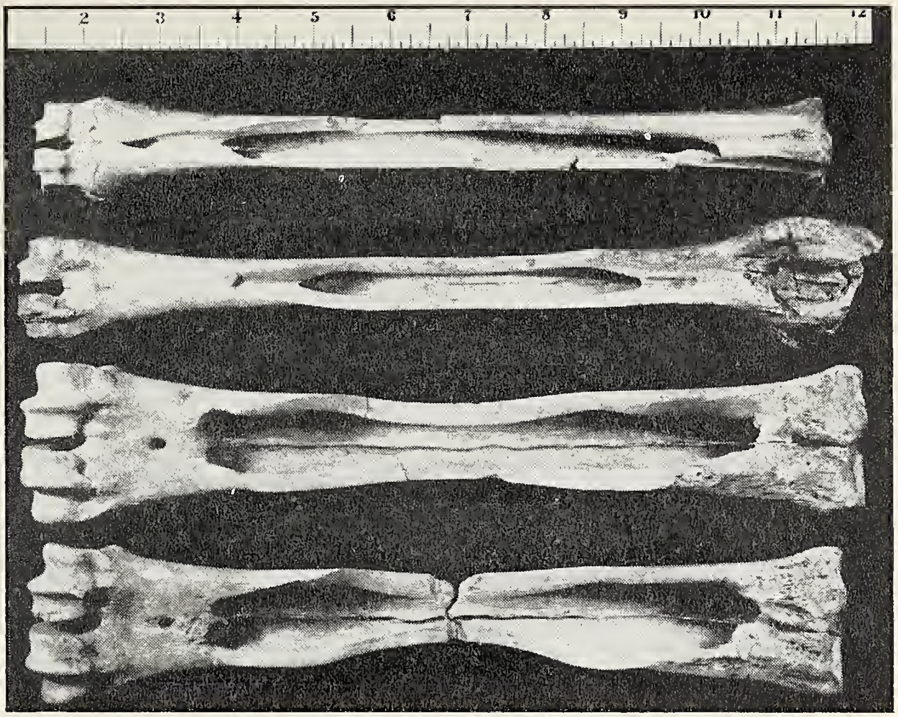

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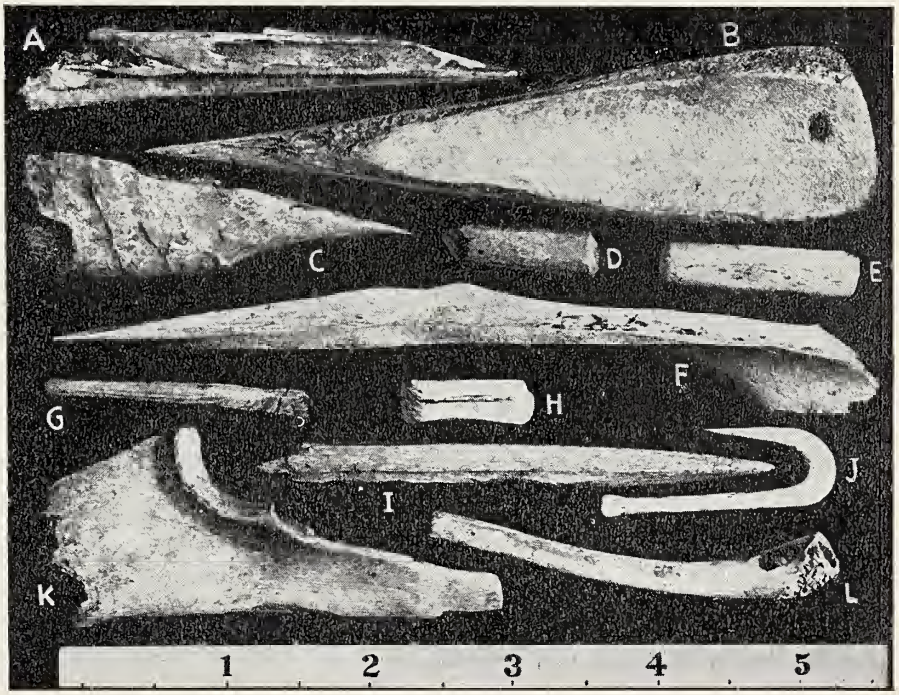

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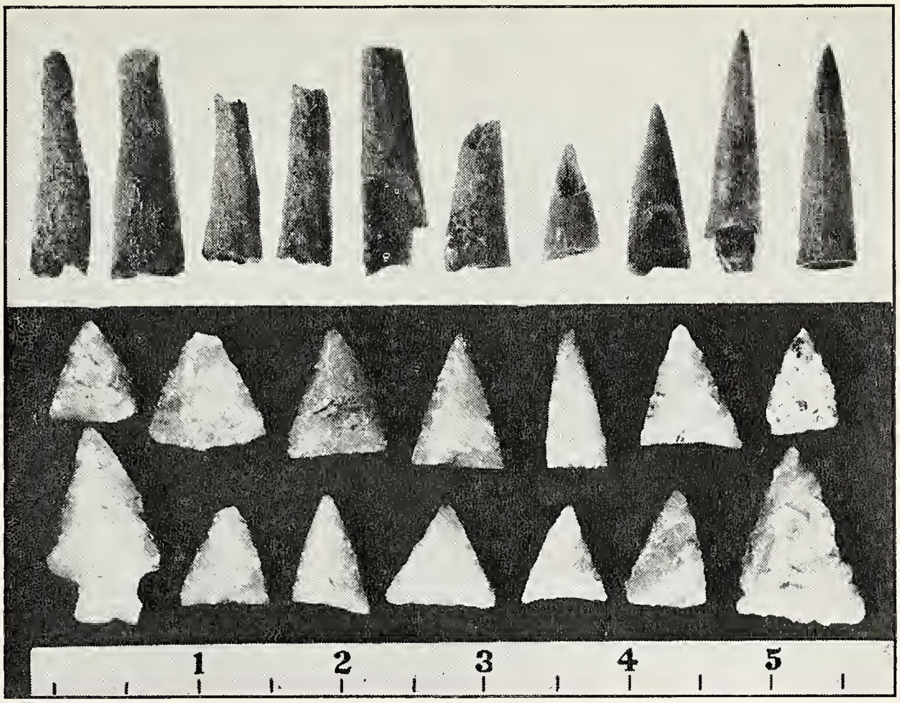

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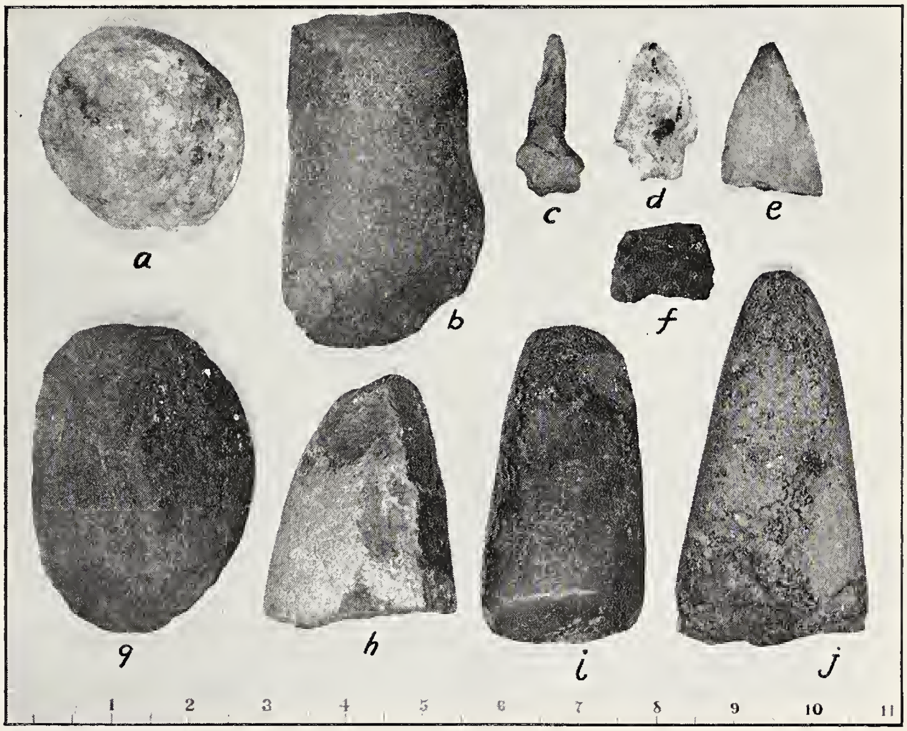

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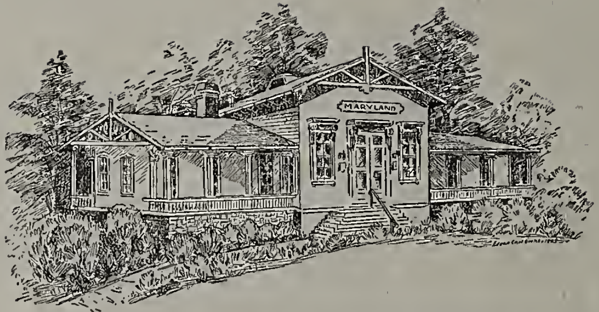

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PROCEEDINGS OF

THE NATURAL HISTORY SOCIETY OF MARYLAND

NO. 7

A DESCRIPTIVE CATALOGUE OF THE AMPHIBIANS AND REPTILES FOUND IN AND AROUND BALTIMORE CITY, MARYLAND, WITHIN A RADIUS OF TWENTY MILES

BY
ROMEO MANSUETI
DEPARTMENT OF HERPETOLOGY

SMITHSONIAN INSTITUTION
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MAR 2 1942
NATIONAL MUSEUM

BALTIMORE, MARYLAND
DECEMBER, 1941

A DESCRIPTIVE CATALOGUE OF THE AMPHIBIANS AND REPTILES FOUND IN AND AROUND BALTIMORE CITY, MARYLAND, WITHIN A RADIUS OF TWENTY MILES

By

Romeo Mansueti

Proceeding No. 7

The Natural History Society
of Maryland
2103 Bolton Street
Baltimore,Maryland

ERRATA

Page 3 - Line 8 - "if" should be "is".

Page 4 - Line 18 - "herpeolotical" should read "herpetological".

Page 5 - Line 36 - "and turtles" should be omitted.

Page 5 - Line 41 - "nakes" should be "snakes".

Page 8 - Line 35 - "has" should be "have".

Page 46 - Line 19 - The date of publication, 1938.

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A DESCRIPTIVE CATALOGUE OF THE AMPHIBIANS AND REPTILES FOUND IN AND AROUND BALTIMORE CITY, MARYLAND, WITHIN A RADIUS OF TWENTY MILES

by

Romeo Mansueti

****

INTRODUCTION

The following annotated list, with descriptions, systematic arrangements, ranges, bibliography, hypothetical list, etc., has been prepared after approximately four years of collecting in and about Baltimore. It is also based on some of the specimens originally in the collection of the Natural History Society of Maryland, upon specimens collected by other persons also interested in the study of herpetology, and on scant literature published on the amphibian and reptilian fauna of this area. The writer has made frequent collecting trips for herpetological specimens on practically every available day in the collecting season, and on these field trips has visited almost every locality listed in the key. The lack of any useful publications on these particular cold-blooded creatures inhabiting Baltimore and vicinity provided adequate inspiration to prepare this list. This paper has only been prepared as a preliminary contribution to the natural history of the Baltimore area.

ACKNOWLEDGMENTS

One of the pleasures in compiling this paper has been the uniform cordiality and generosity of the individuals who have contributed aid and information.

Dr. Robert H. McCauley, Jr., of the Department of Zoology of Goddard College has read over the manuscript and has helped materially with his criticisms. No amount of appreciation could be sufficiently expressed to Dr. McCauley for his unfailing interest in this paper.

The writer also wishes to express his thanks to the following gentlemen: to Father William H. McClellan, S.J., of Woodstock College, in Woodstock, Maryland, for valuable notes on lizards and snakes; to Mr. M. Graham Netting, Curator of Herpetology of the Carnegie Museum in Pittsburgh for encouragement and helpful suggestions; to Dr. Emmett Reid Dunn, Curator of Herpetology of the Academy of Natural Sciences of Philadelphia, for information on Maryland amphibians; to Mr. Louis Putens for the use of his important amphibian records of this area; to Mr. Harry Charles Robertson, for the use of his valuable records of Maryland snakes and lizards; to Mr. George Maugans, Curator of Herpetology of the Natural History Society of Maryland; to Mr. Herbert C. Moore, Editor of the Department of Publication, for many favors granted to the writer. My

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other kind friends, particularly John and William Norman, Elias Cohen, James Leake, Burt Bennett, William Miller, Fred Miller, Henry Eichhorn, Janet Byrns, Mildred Bures, Joseph Bures, Milton Vincent, Frank Groves, Victor Spruil, Rennert Smelser, Joseph Schreiber, Robert Simmons, August Selckman, Lee Runkles, Thurman Sewell, Richard Myers, Conrad Kenny, and many others, have been instrumental in obtaining valuable records.

USE OF SCIENTIFIC AND COMMON NAMES

In nomenclature and systematic classification, the Fourth Edition of the "Check List of North American Amphibians and Reptiles," by Leonhard Stejneger and Thomas Barbour, has been followed as strictly as possible.

The confused state of common names for animals and plants is still a headache to many biologists, particularly herpetologists. In ornithology, common names have a rather firm base, and it is the author's opinion that in the study of herpetology, this phase of nomenclature can be readily accomplished if gone about in the correct way. It is not at all unusual for one species to have more than ten different common names. As many common names of the individual species have been listed as could be accumulated from actual contact of names in use and those that have been noted in literature, since one snake or salamander may have one name in a locality, and an entirely different one in another. The name or names that are most used, and seem the most sensible to the writer, are underlined. One or more underlined names are used to denote the different color stages, habits in life history, metamorphic phases, or any other name that vividly describes the species, and helps to identify it.

SPECIMENS EXAMINED

Practically every species annotated from the Baltimore City area has been seen either alive or preserved. Many collections of other herpetologists have been examined, as well as that of the Natural History Society of Maryland.

To make this paper more serviceable, descriptions of every species mentioned herein have been included. The structural and color details have all been noted from the live and preserved material which the author examined. Needless to say, whenever possible, the writer tried to get the colors of amphibians and reptiles from live specimens. When preserved in formalin or alcohol, many species lose their natural color. For some specimens not on hand, such as Pseudemys floridana concinna, accounts had to be borrowed from reliable publications. The size and length of a species is given in average dimensions.

DISTRIBUTION

From the same source as the nomenclature,- the 1939 edition of the Check List by Stejneger and Barbour, Ranges have been borrowed. The distribution of amphibians and reptiles in Baltimore and vicinity is discussed in the remarks of the text of this list. Since ranges of amphibians and reptiles are continually changing by the extension of their habitat, the change can only be proven with the actual in-

dividual, and thus the importance of the specimen and locality is evident.

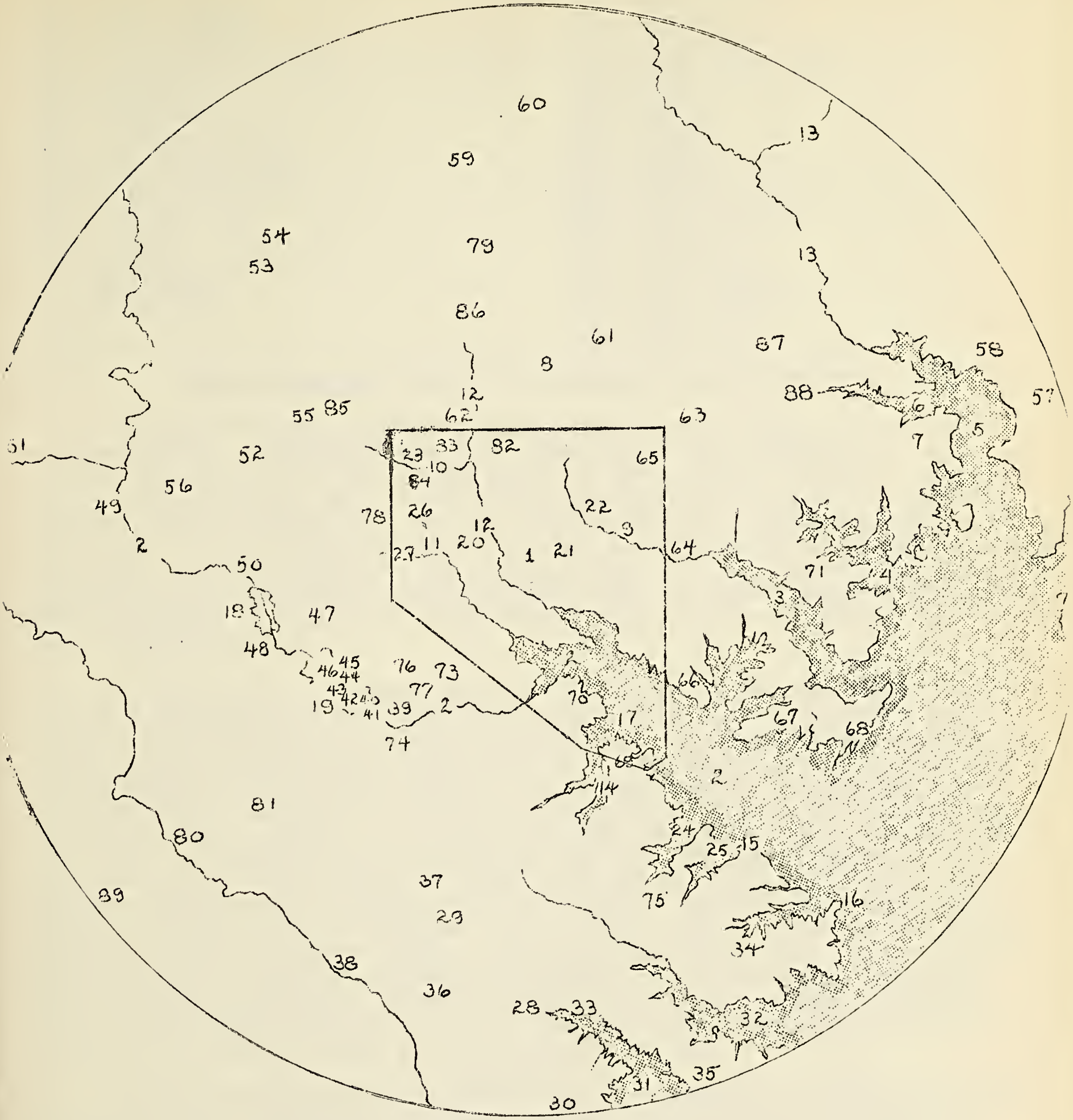
MAP

To facilitate and suggest the location of certain places, a map has been prepared showing the approximate center of Baltimore, from which has been drawn a radius of twenty miles. On the map each inch represents about five miles. Substituted for the names of the localities designated on the map are numbers; therefore, the number if given in the key with the proper name of the represented locality beside it. Many of the proper names appearing on the map have been originated by the inhabitants of the immediate vicinity, and because of their unimportance, they are not to be found on road and survey maps. However, the writer makes mention of several localities in the text which are not noted on the map. The area within the circle embraces three Maryland counties - Baltimore County, Howard County, and Anne Arundel County in addition to Baltimore City. Baltimore City is not in any individual County; the vicinity of the metropolis really embodies the three counties. The map was constructed with the aid of the Maryland Geological Survey's Map of Baltimore County and Baltimore City, from the Shell Map of Metropolitan Baltimore and vicinity, and the State Roads Commission Map of 1935.

KEY TO MAP OF BALTIMORE CITY AND VICINITY

1. Center of Baltimore City
2. Patapsco River
3. Back River
4. Middle River
5. Gunpowder River
6. Bird River
7. Chase
8. Towson
9. Herring Run
10. Western Run
11. Gwynns Falls
12. Jones Falls
13. Gunpowder Falls
14. Marley Creek
15. Fort Smallwood
16. Bodkin Point
17. Curtis Bay
18. Upper Patapsco State Park
19. Lower Patapsco State Park
20. Druid Hill Park
21. Clifton Park
22. Herring Run Park
23. Western Run Parkway
24. Stoney Creek
25. Rock Creek
26. Gwynn Falls Park
27. Hillsdale
28. Camp Linstead
29. Severn
30. Crownsville
31. Severn River
32. Magothy River
33. Indian Landing
34. Lake Shore
35. Arnold
36. Odenton
37. Harmans
38. Patuxent
39. St. Denis
40. Avalon
41. Relay
42. Glenartney
43. Vineyard
44. Orange Grove
45. Ilchester
46. Oella
47. Catonsville
48. Ellicott City
49. Woodstock
50. Hollofield
51. Sykesville
52. Randallstown
53. Reisterstown
54. Glyndon
55. McDonogh
56. Granite
57. Edgewood
58. Joppa
59. Cockeysville
60. Phoenix

MAP OF BALTIMORE CITY AND VICINITY



Scale: One inch = five miles

BOX-LIKE AREA ENCLOSES BALTIMORE CITY

NUMBERS REPRESENT LOCALITIES

61. Loch Raven
62. Lake Roland
63. Putty Hill
64. Herring Run Swamp
65. Hamilton
66. Dundalk
67. Sparrows Point
68. Bay Shore Park
69. Fort Armistead
70. Cherry Hill
71. Essex
72. Poole's Island
73. Lansdowne
74. Elkridge
75. Glen Burnie
76. Arbutus
77. Halethorpe
78. Gwynn Oak Park
79. Texas
80. Savage
81. Jessup
82. Roland Park
83. Pimlico
84. Forest Park
85. Pikesville
86. Timonium
87. Perry Hall
88. White Marsh
89. Highland

NEED OF LAYMAN'S HELP IN NATURAL HISTORY SURVEYS

Usually natural history organizations are pleased to receive herpeolotical specimens from the general public. Frequently such gifts aid greatly in the preparation of reports and surveys, and in many instances rare specimens are acquired in this manner. Rarities, which the collectors seek in vain, often thrust themselves before those who wish to avoid the things which they have been unfortunately taught to shun. If the specimens are common, as they will more often be, the persons participating in such surveys, will at least benefit by having the creatures living about them identified, and are thereby educated as to their habits.

A few words to persons not familiar with the procedure in capturing and transporting amphibians and reptiles. Live specimens are often more appreciated by institutions than dead specimens, unless the latter are preserved properly. In capturing amphibians, the hand may be employed freely without fear, for frogs, toads, and salamanders are absolutely harmless. All of the reptiles other than some of the large snakes, turtles, and a few lizards, which may give a nasty bite, can also be captured with the hand, but this is not recommended to novices. The larger reptiles should be apprehended with care. The larger snakes can be caught with an L shaped stick; the forked or Y shaped stick is not so popular now. The L shaped stick can be placed upon the snake's head or body, and the snake picked up. Anyone can rest assured, that all Maryland serpents, other than the poisonous kinds - the Copperhead, found in the area under consideration, and the Rattlesnake, found only in the extreme western section of the state, are harmless, and the coils are harmless.

In transporting these cold-blooded vertebrates, a few hints may prove helpful. With the thought that all Maryland amphibians and reptiles - the venomous species being the exceptions - are harmless, one can go about the regular procedure of carrying captured specimens safely, but advice and caution against being careless with large "Scorpions", "Racers", and "Snappers", etc., should not go unheeded. Although the capturing of poisonous snakes is not recommended, if the occasion should arise, they should be handled and transported with extreme caution, and placed in heavy linen and burlap bags, tied at several places. All other Maryland snakes and lizards may be transported in ordinary sugar linen bags, the bag being tied securely at

the opening. Snakes seem to exceed Houdini in escaping. Turtles of a small size may be transported in bags of the latter type, but they, with the larger chelonians, can be placed in boxes and moved about conveniently. Frogs, toads, and salamanders must be moved about in moistened containers. To moisten jars, boxes, bags and similar containers, water, wet moss and mud should be employed.

Snakes must be shipped by Express. Lizards, turtles and the like may be transported by Parcel Post and Express. Amphibians may be shipped by the latter methods. Formalin and alcoholic individuals must be wrapped or placed among rags soaked in the respective preservatives, and placed in cans and shipped both ways.

Usually anyone contributing specimens to scientific organizations receives full credit for them. In furnishing specimens, no matter if identified or not, the locality data is extremely important. This should be noted with the date of capture,name of collector, and remarks if possible.

PRESERVATION OF AMPHIBIANS AND REPTILES

To kill an amphibian or reptile, the following manner is advised. This procedure, for scientific purposes, is the most humane known, and in no way mutilates or causes agony on the victim's part for any great length of time. The first method is to place the specimen in a jar or bottle containing the fumes of chloroform or ether - caused by a few drops placed on a rag - and the specimen is thereby overcome by it. The other idea involves the drowning of the individual in a moderate solution of formaldehyde, which is accomplished in a short time. After the specimen is dead, it should be injected with some preservative, preferably formalin, which is more accessible, or alcohol, used in its full 90% strength. For all reptiles, from eight to ten parts of water with one part of formaldehyde seem to serve its purpose. About twelve to fourteen parts of water with one part of formalin will be sufficient to preserve an amphibian properly. Forty per cent formaldehyde may be purchased for a nominal price at drug stores. All specimens should be injected with formalin with a hypodermic needle to prevent decomposition of the parts of the body not reached by the external film of preservative. Frogs, toads, salamanders, lizards, and turtles should be injected at two or three places on the body, while turtles should be injected over all of their exposed flesh. Snakes should be injected about every three or four inches down their body. All the amphibians, lizards and turtles can be placed in a preservative jar in a straight position, while the nakes may be coiled neatly. However, for large turtles, one can not readily prepare them for jars, so that the following method may be used. Kill the specimen, and inject profusely with the preservative, and let the infiltrated specimen remain in this state until the moisture has evaporated. It naturally hardens and will remain in a fine preserved state to be studied. With the individual, the locality, date, collector, etc., should be placed, preferably tied to it.

IMPORTANCE OF AMPHIBIANS AND REPTILES

"What good are they?" is the usual query. To the exhausted expositor the term "there is some good in everything" is the last

hope. Economically, amphibians and reptiles are distinctly more important than much of our natural resources. Proportionately, reptiles and amphibians exceed birds in their usefulness. Naturally the latter are much more abundant, and therefore receive much credit. Eventually, many students of amphibians and reptiles hope that these specimens will be fully protected by Federal and State Conservation laws in the same manner as many birds. Amphibians are wholly beneficial, since their main diet is composed of invertebrates; there again the Aves which also eat insects predominate in numbers. Reptiles feed on mice and other destructive rodents, worms, insects. As food, many Marylanders still delight in eating turtles and frogs. The other reasons why amphibians and reptiles should not be annihilated are quickly disregarded by the average person. The great majority of species in Maryland are absolutely harmless (it is surprising to note that many people still think that the blacksnakes, and many other common reptiles and amphibians, are poisonous). They are really graceful and beautiful creatures.

BIBLIOGRAPHY

It is beyond the scope of this report to include technical descriptions, a key, habits and habitats; but for the guidance of prospective and interested students, the writer has prepared a reference list of the herpetological publications of Maryland and volumes that have a bearing on Maryland forms. Many of the publications are in the author's own collection, while many others may be borrowed from the Enoch Pratt Free and Peabody Institute Library. The library of the Natural History Society of Maryland possesses many fine publications on amphibians and reptiles, which contain articles on habits, etc.

OTHER SPECIES POSSIBLY OCCURRING IN THE BALTIMORE AREA

Besides the species that actually have been recorded from our area, the writer has been confronted with what might inhabit our realm. Many and almost all of the species listed in the hypothetical list have been recorded from somewhere in Maryland, but not in or about Baltimore City. The author has listed all the species which he believes may inhabit Maryland, and after each, has discussed briefly whether it is present ot not in our area.

PROBABLE LIST

1. Cryptobranchus alleganiensis (Daudin) - Hellbender

This salamander has been taken in Maryland, but not in the immediate vicinity. Perhaps it occurs in the large rivers, but it seems that the environment of the Baltimore area is not suited to this creature.

2. Ambystoma jeffersonianum (Green) - Jefferson's Salamander

This species has been collected in Virginia and Pennsylvania, but as yet not in Maryland or in the Baltimore area.

3. Ambystoma tigrinum (Green) - Tiger Salamander

This salamander has been taken in Maryland, but not in the

vicinity of Baltimore.

4. Hemidactylium scutatum (Schlegal) - Four-toed Salamander

As some of the other salamanders, this species has been taken in Maryland, but not in the immediate area of Baltimore.

5. Gyrinophilus porphyriticus porphyriticus (Green) -Purple Salamander

This species has been recorded in western Maryland, but ecological conditions of the Baltimore area seem unsuited to its existence.

6. Siren lacertina Linne - Mud Eel

This unusual amphibian has been taken in the vicinity of Washington, but not around our area.

7. Scaphiopus holbrookii holbrookii (Harlan) - Spadefoot Toad

Although this species has been found in practically every state in Eastern United States, it has not been collected or heard of in Maryland. Its secretive habits probably veil it from collectors.

8. Hyla andersonii Baird - Anderson Tree Frog

To collect one of these beautiful frogs in Maryland or from the area under discussion would indeed be a pleasure to any amateur herpetologist. It skips from New Jersey to the Dismal Swamp in Virginia in Range.

9. Hyla cinerea cinerea (Schneider) - Carolina Green Tree Frog

See species No. 10.

10. Hyla cinerea evittata (Miller) - Miller's Green Tree Frog

Both forms occur, and intermediates are found around the southern border of Maryland. Cinerea has been found as far north as Cecil County, but not in our area.

11. Rana sphenocephala (Cope) - Southern Leopard Frog

Of the many complex arrangements of identification of reptiles and amphibians, the Rana pipiens - sphenocephala appears to need the more changing. Dr. Dunn states that sphenocephala is a strict synonym of pipiens. Both species, if distinguishable, look very near alike if not the very same.

12. Rana virgatipes Cope - Sphagnum Frog

This species also skips from New Jersey to Virginia, but has not been taken in Maryland.

13. Gastrophryne carolinensis (Holbrook) - Narrowmouth Toad

This species has been taken at Cove Point in southern Maryland, but not in our area as yet.

[illegible]

[illegible]

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14. Leiolopisma unicolor (Harlan) - Ground Skink

Although this species has been taken in southern Maryland, and in New Jersey, it has not been found in the Baltimore region.

15. Pituophis melanoleucus (Daudin) - Pine Snake

This species is said to have been collected on the Eastern Shore of Maryland, but nowhere around Baltimore or west.

16. Lampropeltis triangulum temporalis (Cope) - McCauley's Milk Snake

This recently redescribed snake has been taken at several points in Maryland, at Cove Point and on the Eastern Shore, but not in the vicinity of Baltimore. This species may be mistaken for the Common Milk Snake.

17. Natrix erythrogaster erythrogaster (Forster) - Red-bellied Water Snake

No Maryland records are in existence as yet. Yet it may occur in Maryland or even the Baltimore area. It may be mistaken for the Common Water Snake.

18. Crotalus horridus horridus (Linne) - Timber Rattlesnake

This snake is impossible in our area.

19. Clemmys insculpta (Le Conte) - Wood Turtle

This turtle has been taken on the Eastern Shore and Western Maryland, but not in our area. It very probably occurs here.

20. Malaclemys centrata concentrica (Shaw) - Chesapeake Diamond Back Terrapin

No actual specimens are known from the bay around Baltimore. No doubt it does occur.

21. Clemmys muhlenbergii (Schoepff) - Muhlenberg's Turtle

Although this species is very rare as a whole along the eastern coast, it has been found in Pennsylvania and Virginia, but not in Maryland. Suitable environments are found in Maryland for this turtle, but as yet it is absent.

22. Chelonia mydas (Linne) - Green Turtle

23. Eretmochelys imbricata (Linne) - Hawksbill Turtle

24. Caretta caretta (Linne) - Loggerhead Turtle

25. Dermochelys coriacea (Linne) - Leather-back Turtle

All of these marine turles may come up the bay into our radius as stray individuals. In the Magothy River, several "monstrous" turtles has been seen at various times, and likely these specimens may be the common Loggerhead Turtle. Off Cove Point, several of the sea turtles have been seen.

INTRODUCED FORMS

Every state or country must bear the introduction of species not indigenous. These are either transported by humans or by natural means. Obviously, they occur rather infrequently, but their importance must be noted. In our locality, foreign species are readily acquired because of our position as a seaport. Tropical forms come in fruit boats in abundance, but are usually killed before someone who is interested may interfere. Forms used as foods, particuarly the Pseudemys and marine turtles may escape and establish themselves. Also many are bought as pets from dealers, and if some occasion should arise for getting rid of these specimens, they are usually taken to some "natural home" place and liberated. Many of the species usually do not survive, and the individuals that do, eventually die off because of the lack of their natural environment. The introduced forms in our area are few, because no particular interest has been taken in them by anyone. The writer has listed those which he has heard of, and perhaps many more forms have been known to roam our territory for a time.

Several records have come to the attention of the writer. They are as follows:

In 1935 an Axolotl or a larva form of the Mexican Tiger Salamander was collected in Jones Falls, near Rockland, above Bare Hills. Elias Cohen informed the writer that a certain university Professor had purchased a number of these creatures for study, and had eventually liberated a number of them. There is a possibility of its not being a member of his series; however, no other specimens have come to my attention.

Several Giant Cuban Tree Frogs have been taken from Fruit Boats hailing from Tropical America. They are mostly taken from bunches of bananas. They are usually killed by stevedores, or thrown in the water.

Elias Cohen informed the writer that a Blanding's Turtle was collected crossing a road in Pimlico in our city. It was somewhat out of its range, and no additional specimens have been captured; thus the above specimen was probably brought here.

Several Cuban Boas have been taken in banana boats. One particular snake succeeded in getting to a banana vendor. This particular dealer kept it in a banana refrigerator for about a month, and then gave it to the writer. Most of them are killed.

Several South American Boas have been also taken in bunches of bananas. Many are found wandering around the compartment in which the bananas are stored, and share the same fate as the Cuban Boa. Anyone wishing to examine banana boats for amphibians and reptiles find that it is almost an impossibility to do so. Thus many other species escape notice. Usually there are certain seasons when these creatures begin to arrive in the boats.

One South American Chicken Snake was given to Elias Cohen, and it was found on a banana boat.

PLATE I

Legend to Figures

AMPHIBIANS

Figure 1. American Toad, *Bufo americanus americanus*, specimen Illustrated Collected at Picnic Grounds, Catoctin Recreational Area, Frederick County, About 1/2 Natural Size

Figure 2. Baird's Cricket Frog, *Acris crepitans*, Specimen Illustrated Collected near Arbutus, Baltimore County, About Natural Size

Figure 3. Eastern Swamp Tree Frog, *Pseudacris nigrita feriarum*, Specimen Illustrated Collected near Western Run Parkway, Baltimore City, Natural Size

Figure 4. Spring Peeper, *Hyla crucifer*, Specimen Illustrated Collected at Vineyard, Patapsco State Park, Baltimore County, About Natural Size

Figure 5. Slimy Salamander, *Plethodon glutinosus*, Specimen Illustrated Collected at Gambrill State Forest, Frederick County, About 1/2 Natural Size

Figure 6. Common Red Salamander, *Pseudotriton ruber ruber*, Specimen Illustrated Collected at Glenartney, Patapsco State Park, Baltimore County, About 1/2 Natural Size

Figure 7. Rare Red Salamander, *Pseudotriton montanus montanus*, Specimen Illustrated Collected near Western Run Parkway, Baltimore City, About 1/2 Natural Size

Figure 8. Green Frog, *Rana clamitans*, Specimen Illustrated Collected near Arbutus, Baltimore County, About 1/4 Natural Size

Figure 9. Common Long-tailed Salamander, *Eurycea longicauda longicauda*, Specimen Illustrated Collected at Orange Grove, Patapsco State Park, Baltimore County, About Natural Size

Figure 10. Spotted Salamander, *Ambystoma maculatum*, Specimen Illustrated Collected near Western Run Parkway, Baltimore City, About 1/2 Natural Size

Figure 11. Common Dusky Salamander, *Desmognathus fuscus fuscus*, Specimen Illustrated Collected at Glenartney, Patapsco State Park, Baltimore County, About 1/2 Natural Size

Figure 12. Leopard Frog, *Rana pipiens*, Specimen Illustrated Collected at Vineyard, Patapsco State Park, Baltimore County, About 1/2 Natural Size

Figure 13. Pickerel Frog, *Rana palustris*, Specimen Illustrated Collected in Herring Run Swamp, Baltimore County, About 1/2 Natural Size

A friend of the writer liberated a large Yellow Rat Snake in the vicinity of Hamilton.

There is no doubt that many other specimens have been introduced. Usually foreign species do not establish themselves.

*****

ECOLOGICAL FACTORS OF BALTIMORE AND VICINITY

Physiographically and biologically, Baltimore and vicinity varies greatly.

The Baltimore area is divided physiographically into two parts - the Coastal Plain, comprising the southeastern half, and the Piedmont Plateau, which ranges through the remaining portion. The Fall Line dissects Baltimore and vicinity, following a zone from northeast to southwest. It must be understood that zoologically, the fusion of these divisions is not sharp, and does not serve as a barrier for species characteristic of one division and absent from another. The ecological condition of the area really controls the distribution of the form in a locality.

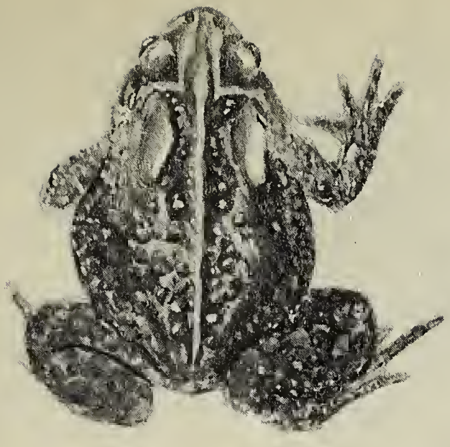
Generally speaking, it seems that ecological factors in small geographical areas have a greater effect on the distribution in a diverse range, such as the Baltimore region, rather than that the distribution of the amphibians and reptiles in an area is controlled by very broad factors known as Life Zones.

Vegetation, from mosses and lichens to grasses and trees, influenc the lives of amphibians and reptiles considerably. The dominent vegetation of the Baltimore area is deciduous forest. Soils, rocks, spring ponds, streams, rivers, as well as the general terrain exert their advantages on these particular cold-blooded creatures. A large percentage of the waterways shown on the map of Baltimore City and vicinity is brackish, whereas practically all lakes, ponds, streams, springs, and inland rivers are fresh.

The most conspicuous factors are temperature, rainfall and humidity, but they have a practically uniform effect on the small area of Baltimore. These three climatic conditions have a tremendous effect on the life history of amphibians, whereas, only temperature and humidity regulate the vital processes of the reptiles.

Many species are limited to an environment or series of habitats because of the occurrence of other animals. The food of amphibians and reptiles varies very much, and food may be one of the reasons why certain species (Bull Frogs, Leopard Frogs, Common Water Snakes, Common Mud Turtles) have adapted themselves to brackish water.

In our area, certain species generally characteristic of the Coastal Plain, often range over the Fall Line to the edge of the Piedmont, but they (Rare Red Salamander, Leopard Frog, Common Worm Snake, Common King Snake) cannot be said to be indigenous to the Plateau. The majority of the herpetological forms of Baltimore City and vicinity are omnipresent in the two ecological divisions.



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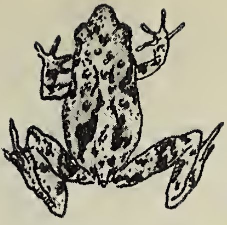

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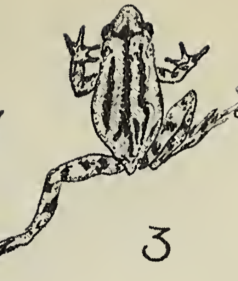

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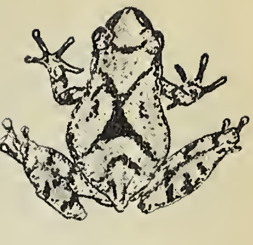

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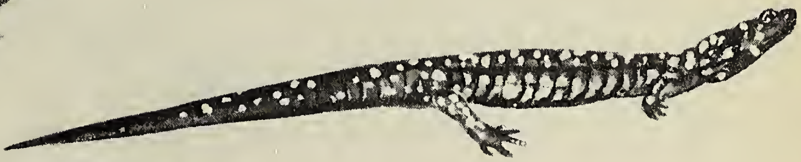

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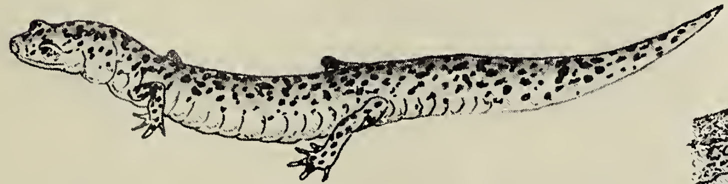

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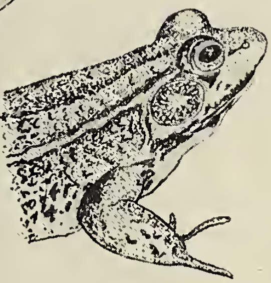

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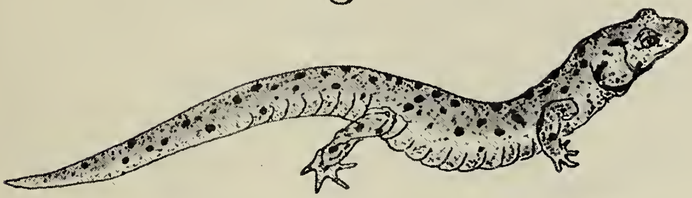

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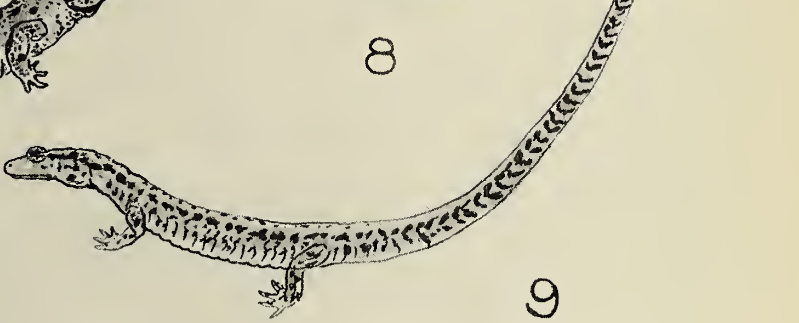

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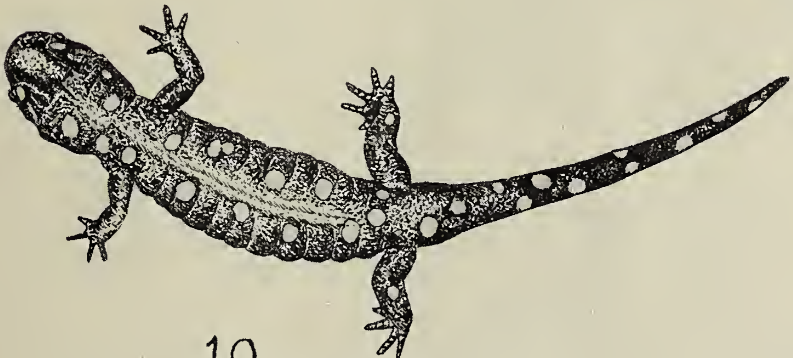

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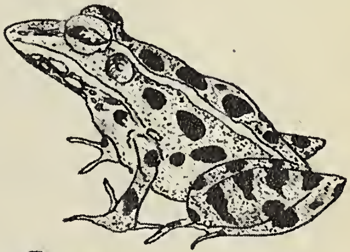

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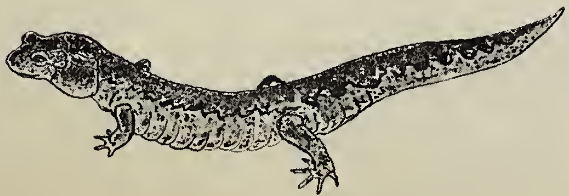

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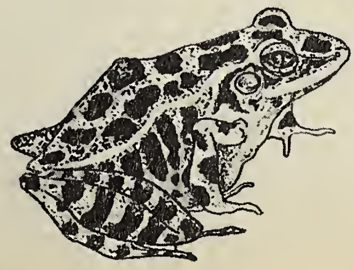

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Class: AMPHIBIA Linne
Amphibians

Order: CAUDATA Oppel
Salamanders

Suborder: MUTABILIA Merrem

Family: SALAMANDRIDAE
Newts

Genus: TRITURUS Rafinesque

1. Triturus viridescens viridescens (Rafinesque)

Common Newt, Red Eft or Ebbet, Land Newt, Water Newt, Spotted Triton, Green Triton, Orange Triton, Ebbet, Newt, Red Spotted Eft, Eft, Spring Lizard.

Description: Because of this species' peculiar life history, involving a past-larval period of life on land and a subsequent return to the water, two structural and color phases exist. The land stage is smaller than the adult, has a rough skin, lacks a tail fin , and is red, orange or yellow in ground color. The aquatic or mature stage has a smooth skin. The compressed tail is heavily finned, the color is brown, brownish yellow, or olive green, and there is frequently a light mid-dorsal stripe. The eyes are large, but do not protrude as do those of most other salamanders. This species reaches a length of about four inches. The head bears two longitudinal ridges between the eyes extending from the parietal region to the snout. Both the terrestrial and aquatic phases bear a row of black-edged bright red spots on each side of the mid-dorsal line. These spots are variable in number, but there are usually not more than six on each side. The belly is light yellowish, speckled with black.

Range: Eastern North America, northern Ontario (Severn River), and the height of land in Quebec, to Wisconsin, northern Illinois and Georgia.

Remarks: Both the land and water stages have been collected in abundance throughout the selected area, - especially at Towson, Western Run Parkway and surrounding region, at the two Patapsco State Parks, Randallstown, Herring Run Park, Gunpowder Falls area, Crownsville, Catonsville, Gwynns Falls Park, Bare Hills, and in other scattered localities.

Family: AMBYSTOMIDAE

Blunt-nosed Salamanders

Genus: AMBYSTOMA Tschudi

2. Ambystoma maculatum (Shaw)

Spotted Salamander, Yellow Spotted Salamander , Dotted Salamander, Blotched Salamander, Spring Lizard, Spotted Eft, Spotted Blunt-nosed Salamander, Dusky Salamander

Description: This is the largest salamander in this area, reaching a length of six inches. Its structural features include a stout body and legs, a broad head with a large mouth and a broad and rounded snout. The tail is thick at the base and compressed at the end. The smooth skin is pitted by countless minute pores. There are usually eleven costal grooves. The ground color is usually very dark purplish brown, slate, grayish brown or black. The ventral surface is a dark gray. There are about eight or nine bright yellow spots on each side of head and body, and about five or six on each side of the tail. The sides and legs are peppered with small white specks.

Range: The Gaspe Peninsula and Nova Scotia westward through Canada to Wisconsin, southward to Georgia, Florida and Texas.

Remarks: This salamander is very common in our area, and has been found more abundantly in the city than outside. Throughout northwest Baltimore around Western Run Parkway, McMahon Quarry and Curtis Wright Airport, both young and adults have been taken. John and William Norman have found numerous individuals in one of this species' "migrations" this spring at this area. They have also been captured at the McDonogh School for boys, and near St. Mary's Seminary, throughout Herring Run Park, at Glenartney and at Vineyard in the lower Patapsco State Park.

3. Ambystoma opacum (Gravenhorst)

Marbled Salamander, Mole Salamander, Black and White Salamander

Description: The physical characteristics of this salamander are very similar to those of the preceding form, and it also has eleven costal grooves, but the color pattern is different. The ground color is a very dark brown or black, with a series of white, light gray, or silvery transverse bands crossing the back and tail. These are wider laterally (like the pattern of the Copperhead snake), forming a series of transverse hour-glass shaped markings on the back. The head is unevenly marked with white. The legs and abdomen are dark, and are sometimes peppered with white. This salamander usually attains a length of about four inches.

Range: From New Hampshire to Georgia, west to Louisiana, Oklahoma, and Texas, Mississippi basin north to Arkansas, Missouri, Indiana, and Illinois.

Remarks: We know of one specimen which has been collected from the Baltimore area. This salamander was found by James Leake secreted under a pile of loose rocks and clay along Gwynns Falls Park in Baltimore City.

Family: PLETHODONTIDAE

Lungless Salamanders

Genus: DESMOGNATHUS Baird

4. Desmognathus fuscus fuscus (Rafinesque)

Dusky Salamander, Gray Salamander, Mole Salamander, Black Salamander, Water Salamander, Water Lizard, Spring Lizard, Gray Lizard

Description: The Dusky Salamander is a stout but very active amphibian which attains a total length of about five inches. The tail is keeled above. The head is moderate in size and the cheeks are swollen. The legs are short but well developed. There are usually twelve to thirteen costal grooves. The ground color of this salamander is a dark brown or nearly black. Young specimens have a definite broad dorsal band, light in color and bordered with black, from the head to the tail. This gradually becomes obscure with age. Old specimens are totally brown with speckled black spots. The sides of the body are dotted with white, and the belly is gray. A light line runs from the nose to the eye.

Range: St. John's River, New Brunswick, to northwestern Florida, Mississippi, and Illinois.

Remarks: Every stream examined has produced at least one of these amphibians, but they are absent from ponds. As they are common throughout the year, particularly in the spring, they have been collected from all the streams and springs at both the Upper and Lower Patapsco State Parks, Arbutus, Ellicott City, Halethorpe, Herring Run Park, Clifton Park, Western Run Parkway, Gwynns Falls Park, Gwynn Oak Park, Jones Falls Area, Cherry Hill, Severn, Towson, Catonsville, Gunpowder Falls area (between Harford Road and Philadelphia Road), Crownsville, Texas, Bare Hills, St. Mary's Seminary, and from areas surrounding these localities.

Genus: PLETHODON Tschudi

5. Plethodon cinereus (Green)

Red-backed Salamander, Speckled Salamander or Dusky Salamander

(Gray phase), Orange-backed Salamander, Brown Salamander, Black Salamander, Yellow-backed Salamander, Red-back

Description: This salamander is very slender, with short and thin legs, and attains a length of about three and a half inches. The head is flat and somewhat wider than the neck, the eyes are prominent, the mouth large. The tail is long, round and tapering in length equal to and sometimes longer than the body. There are usually sixteen to seventeen costal grooves. Three color phases have been found in our area: the red-backed phase with a long, broad, orange or rich brown dorsal band extending from the head to almost the end of the tail, the yellow-backed form, with the dorsal band yellow instead of orange, and the melanistic form which is uniform dark brown or black dorsally. The first two phases have a general ground color similar to that of the dark phase. In all the forms, the dark pattern is profusely speckled with fine white dots. The belly is mottled with gray. Some specimens have a curious abstruse three-pointed (triangular) blotch on the head. As with the rest of the caudate amphibians, (except Triturus) this species has a very smooth shiny skin.

Range: Gaspesia and Cape Breton Island west to Fort William, Ontario, south to Dallas, Georgia, Missouri and Arkansas.

Remarks: This species is as common as the preceding salamander but is ecologically different. The Red-backed Salamander is entirely terrestrial, being found under rocks in moist woods, often on high hills away from water, while the Dusky Salamander is distinctly a stream and spring lover. This amphibian has been taken at nearly every locality listed in the key to the map.

6. Plethodon glutinosus (Green)

Slimy Salamander, Salt and Pepper Salamander, Speckled Eft, Black Salamander, Pepper Salamander, Spotted Salamander

Description: This salamander is similar in form to the preceding, but reaches a length of about six inches. The smooth, shiny skin is covered with numerous minute pores which exude a slimy substance, hence the species' popular caption. There are usually fourteen or fifteen costal grooves. The ground color is bluish black or black, with numerous white or silvery spots or blotches on the sides and back, each about the size of the eye or smaller. Some of the spots on the sides of some specimens are very large. The abdomen is light immaculate slate or blue with many minute specks of white.

Range: Southern New York to Wisconsin, south to northern Florida, the Gulf States to Texas and to Missouri.

Remarks: This species is apparently rather rare since is has only been taken in the highlands of the Gunpowder Falls near Harford Road, and it is said to have been taken in the Pa-

tapsco State Park, but no specimens are available from this region.

Genus: PSEUDOTRITON Tschudi

7. Pseudotriton montanus montanus (Baird)

Rare Red Salamander, Mountain Red Salamander, Baird's Salamander

Description: This species is stout-bodied in comparison with other salamanders of this area and attains a length of five or six inches. The tail is short and compressed, the head broad and blunt, and the costal grooves number seventeen. The ground color of this species is dark red, with less orange than the Red Salamander. This species is spotted with black like the Red Salamander, but the spots are irregularly scattered over the dorsal surface, and are circular and not as large as the spots in P. ruber. These spots are few, and serve as a very distinguishing character. The ground color of this species becomes so dense with age that the spots are unable to be seen on certain specimens.

Range: Northern New York to western Georgia and westward to Ohio, Kentucky, and Tennessee.

Remarks: Heretofore, the writer did not have the faintest idea that this species occurred on the Coastal Plain, but rather imagined that it was indigenous to the mountainous regions of Maryland; consequently, all specimens of the Red Salamander were labeled as ruber. As the technical specific name implies (montanus), this salamander was generally known as the Mountain Red Salamander in Baltimore, but recently, Mr. James A. Fowler, of Georgetown University in Washington, examined a whole series of Red Salamanders from Baltimore, and identified several as montanus; thus, disproving the fact to a few of us that this species is not a mountainous form. These specimens were collected by William and John Norman in the northwestern section of Baltimore. William Miller caught two Red Salamanders from Clifton Park which were very sparsely spotted, but unfortunately, they were not preserved, so no definite conclusions can be made.

8. Pseudotriton ruber ruber (Sonnini)

Common Red Salamander, Vermilion Eft, Red Triton or Eft, Red Ebbet, Scarlet Salamander, Spotted Salamander, Spring Lizard Spring Salamander, Spotted Red Salamander, Scorpion, Pink Salamander, Purple Salamander

Description: The Common Red Salamander is proportioned like its relative, the Rare Red Salamander. The costal grooves usually number sixteen. The ground color is a bright red, pink or orange, while very old specimens are dark brown or purplish. Black spots about the size of the eye are profusely scattered over the head, back and tail, but the ventral surface, pinkish in color, is almost free from dots. There is sometimes a dark bar across the eye.

Range: From Albany County, New York, to northern Georgia, westward to Ohio, Kentucky, Tennessee, Alabama, northern Mississippi.

Remarks: This species has appeared quite frequently in Herring Run Park, Clifton Park, Western Run Parkway, all of the Pa-

tapsco State Park and adjacent area, Gwynns Falls Park, Gwynn Oak Park, Gunpowder Falls region, Loch Raven, Catonsville, Ellicott City, Green Spring Valley, and all around the surrounding area of these localities. It has been collected in many other places, and is usually taken more frequently in the spring of the year.

Genus: EURYCEA Rafinesque

9. Eurycea bislineata bislineata (Green)

Two-lined Salamander, Striped Salamander, Gold-backed Salamander, Spring Lizard, Spring Eft, Newt, Lined Salamander.

Description: The Two-lined Salamander reaches a length of three or four inches. It is slender in form and the head is rather large, but is not much wider than the neck. There are from thirteen to fifteen costal grooves. The dorsal and ventral gound color is yellow, with a black line on each side of the back reaching from eye to almost the end of the tail. Some individuals have a faint broken line between the two dorsal black lines, which are also sometimes broken.

Range: Quebec, New Brunswick, to Indiana, Tennessee, and Virginia.

Remarks: The Two-lined Salamander has been collected at and near Jones Falls, Gwynns Falls, Western Run Parkway, all of the Patapsco State Park, Gunpowder Falls region, Herring Run Park, Bare Hills, Towson, etc. These animals are found more abundantly in springs and cold streams in the spring of the year.

10. Eurycea longicauda longicauda (Green)

Long-tailed Salamander, Orange Salamander, Spotted Eft, Spotted Salamander, Orange Lizard, Barred Salamander, Scorpion, Rock Salamander, Red Salamander, Tail Salamander

Description: This, the most slender salamander found in our area, reaches a length of four to six inches. It has a slender body, small legs, conspicuous and large eyes. The tail is much longer than the body, and is vertically compressed. The skin is smooth and shiny. The ground color is a brilliant orange or yellowish orange, with black spots arranged more or less in two broken lines from the head to the hind limbs where they develop into vertical bars and bands on the tail. The limbs are spotted and the belly is immaculate yellowish white.

Range: Central New York to northern Georgia, westward to southern Missouri and northeastern Arkansas.

Remarks: This salamander may be regarded as a common species

in our area in certain localities, although it is totally absent in some sections. It has been taken all through the Patapsco State Park and vicinity, Gunpowder Falls area, Western Run Parkway and vicinity, Bare Hills, Jones Falls, Gwynns Falls Park, and several other places. It is rather terrestrial in habits.

Order: *SALIENTIA* Laurenti

Frogs and Toads

Suborder: *LINGUATA* Gravenhorst

Family: *BUFONIDAE*

Toads

Genus: *BUFO* Laurenti

11. *Bufo americanus americanus* (Holbrook)

American Toad, Common Toad, Hop-toad, Toad, Wart Frog, Common Bufo, Bufo, Spring Toad, Poison Toad, Brown Toad, Red Toad, Holbrook's Toad

Description: This toad attains an extreme length of about four inches, and with its stubby head and broad body is very stoutly built. The paratoid glands are bean-shaped, very large, and are located a short distance behind the eyes. The head, back and limbs are heavily covered with warts. The hind limbs are somewhat webbed, and the fingers and toes have horny tips. The hind feet have a black spur which is used for digging. The color varies from brown or olive-green, to blackish and appears to vary somewhat with the temperature. The warts may be either orange, brown, yellow, or red. Some individuals are almost completely black. The dark spots present on the back usually enclose one wart. The ventral surface may be yellowish or dirty white, usually spotted with black, especially on the chest region. In the males, the throat is black.

Range: Eastern North America from Hudson Bay to Alberta and Labrador southward.

Remarks: In checking over a series of *Bufo a. americanus* and *Bufo fowleri* from this area, only a very small percentage were *americanus*. Almost all toads labeled *americanus* proved to be the more common *fowleri*. However, this toad has been collected and recorded from all through the Patapsco State Park, Gunpowder Falls region, Crownsville, and Western Run Parkway. This species may be regarded as relatively rare in this area. In western Maryland, *americanus* is very abundant, and *fowleri* is rare.

12. Bufo fowleri Hinckley

Fowler's Toad, Common Toad, Spotted Toad, Yellow Toad, Brown Toad, Hop-toad, Toad, Wart-frog, Green Toad, Sand Toad, Beach Toad

Description: The body structure of this toad, which grows to a length of about three inches, is very similar to that of the American Toad. The warts are less prominent and smaller and therefore the back is not as rough as in B.a. americanus. The hind legs are slightly longer on this species. Fowler's Toad is usually more brightly colored than the American Toad; the hues vary from a light yellow to tan, brown, auburn, orange, gray, etc. Numerous dark blotches cover the back, and each encloses several warts. These warts may be bright orange, yellow, or red. The ventral surface is usually immaculate. The ridges behind the eye usually touch the paratoid glands, while in the American Toad they are connected to the paratoids by a longitudinal ridge.

Range: New England and New York, southward to Georgia, west to Michigan and Missouri, but occurring also on the Atlantic and Gulf coastal plain to central Texas.

Remarks: As mentioned previously, Fowler's Toad is more abundant than the American Toad. It has been collected and observed in practically every locality suitable to its livelihood listed in the key, including the following: all of the Patapsco State Park and around it, Camp Linstead, Indian Landing, Lake Shore, Woodstock, Texas, in and around the Gunpowder Falls area, Gwynns Fall Park, Gwynn Oak Park, Herring Run Park and Swamp, Western Run Parkway, Clifton Park, Druid Hill Park, Cherry Hill, Crownsville, Bare Hills, Randallstown, Reisterstown, Chase, all along the Magothy, Gunpowder, Patapsco, Severn, Middle, Bird, etc. Rivers, and many other localities, usually those of a sandy and sparsely wooded type.

Family: HYLIDAE

Tree Frogs

Genus: ACRIS Dumeril and Bibron

13. Acris crepitans Baird

Piedmont Cricket Frog, Baird's Cricket Frog, Cricket Frog, Cricket, Spring Cricket, Spring Peeper, Savannah Cricket Frog, Cricket Tree Frog, Striped Tree Frog, Striped Cricket Frog, Green Striped Tree Frog, Swamp Tree Frog, Striped Tree Toad, Triangle Tree Frog, Three Striped Tree Frog, Three-lined Cricket Frog, Reed Tree Frog

Description: This small tree frog grows to a length of about one inch. It has a long sharp snout, long and slender legs,

and its toes do not have enlarged disks. The skin is covered with minute warts and appears rather rough. The ground color may be black, dark brown, reddish brown, green, gray, etc. The back when dark usually has green or gray stripes or the colors may be reversed. A dark triangular mark is usually present between the eyes. The belly is white, but the throat is dark in male specimens.

Range: Connecticut to the Canadian Northwest, and to Georgia, Louisiana and Texas, from sea level to 2000 feet.

Remarks: Though rarely collected or heard after the spring of the year, this tree frog has been recorded at Arbutus, Relay, Avalon, Vineyard Springs, Glenartney, Orange Grove, Cherry Hill, Crownsville, Lake Roland, Bare Hills, Western Run Parkway, Gwynns Falls Park, Herring Run Park and Swamp, Gunpowder Falls area between Harford and Philadelphia Road, Loch Raven, and Camp Linstead, and has been reported from other places in Maryland.

Genus: PSEUDACRIS Fitzinger

14. Pseudacris nigrita feriarum (Baird)

Eastern Swamp Tree Frog, Swamp Chorus Frog, Chorus Frog, Piedmont Swamp Tree Frog, Piedmont Chorus Frog, Swamp Tree Cricket, Striped Tree Frog, Cricket Frog, Three-striped Tree Frog, Three-striped Chorus Frog, Striped Cricket Frog, Chorus Frog, Singing Frog, Spring Peeper, Cricket, Peeper

Description: This tree frog, which resembles the preceding species, is slightly larger than the Cricket Frog, reaching a length of over an inch. The snout is rounded and not as long. The fourth toe is very long, and there are small disks present. The color of this species varies from almost white or yellow, to tan, brown or gray. Three dark stripes, which are usually parallel, and seldom interrupted, are present on the back. The ventral surface is almost white and the males usually have dark throats. There is a dark stripe from the eye and snout to the shoulder.

Range: Eastern United States, west to Illinois.

Remarks: Wherever found, this frog is very common. Around and in the following localities this frog has been found in abundance in the spring: Western Run Parkway, Gwynns Falls Park, Vineyard, and Crownsville.

Genus: HYLA Laurenti

15. Hyla crucifer Wied

Spring Peeper, Tree Frog, Pickering's Tree Frog, Peeper, Cross-backed Tree Frog, Cross Tree Frog, Yellow Tree Frog, Chorus Frog, Spring Swamp Frog, Noisy Hyla, Puddle Tree Frog,

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Spring Frog

Description: This interesting little frog reaches a length of three-fourths to one and a quarter inches. It is moderately stout with a rather pointed snout and smooth skin. The feet are not webbed and the toes are equipped with strong adhesive disks. In the spring the ground color of this species is usually dark, usually brown, with darker bands which form an oblique cross. During other periods in its life history, it may be orange, yellow, brown, reddish brown, tan, coppery colored, etc. The stripes on the back and limbs are always darker. The ventral surface is usually whitish yellow, but the male may have a dark throat.

Range: Gaspé Peninsula to Manitoba, south to Georgia, Florida, Louisiana, Arkansas, and Kansas.

Remarks: At any pool of water in our area in the spring of the year, the clear shrill mating peep of this tiny frog can be heard. To conserve space, the localities, which would exceed the list in the key, will not be enumerated. It is truly the most common of Maryland frogs, but there is a very sharp decline in its numbers after the breeding season, when they disappear from water and scatter in the surrounding terrain.

16. Hyla versicolor versicolor (Le Conte)

Common Tree Toad, Common Tree Frog, Gray Tree Toad, Gray Tree Frog, Rain Toad, Rain Tree Frog, Rain Frog, Sunshine Tree Frog, Rain Triller, Triller, Chameleon Tree Frog, Many-colored Tree Frog, Green Tree Frog, Turkey-gobbler Tree Frog, Emerald Hyla, Versicolor Tree Frog

Description: This is the largest tree frog to be found in Maryland. It ranges in size from and one-half to two and one-half inches in length. The body is rather stout, and the skin is soft but has a rough ahd warty appearance. The head is short and blunt. The feet are somewhat webbed, and the disks are large and conspicuous. The ability of this species to change color is interesting. When resting on some objects, the ground color is gray with large dark spots. At other times, it is very pale, while some specimens are nearly white with green blotches. Some are entirely green, brown, etc. The legs are spotted and banded. A typical specimen has a large blotch on the back resembling a star or crude diagonal cross, and other spots scattered over the back. These are usually outlined with black, whether the color of the spot is green, gray or black. The ventral surface is grayish white. A very distinguishing mark of this species is the brilliant orange or yellow on the hind limbs and posterior portion of the lower body; this is covered with a fine network of black. There is a white mark below the eye.

Range: Maine, southern Canada, west to Minnesota, south to the Gulf States and to the Ocklawaha swamp in Florida, Texas and Arkansas in part only.

Remarks: Although probably very common, this dainty tree frog has only been collected sparingly from Glenartney, Vineyard Springs, Herring Run Park and Swamp, Northwest and Southeast Baltimore, Gwynns Falls Park, Camp Linstead, Lansdowne, Furnace Branch, Arbutus, Loch Raven, Gunpowder Falls area, and Texas.

Family: RANIDAE

True Frogs

Genus: RANA Linne

17. Rana catesbeiana Shaw

Bullfrog, Chug-o-rum, Chicken Frog, Edible Frog, Croaker, Giant Frog, Goliath's Frog, Cannibal Frog, Croaker, Pond Frog, Devil Frog, Cow Frog

Description: This, the largest frog, both in bulk and length, to be found in Maryland, attains a body length of six to nine inches. The body is stout and there are no prominent ridges on the back. The hind feet are broadly webbed. The head is broad and flat. The tympanum or ear flap is almost twice the size of the eye in the males, but not larger than the eye in the females. There is a conspicuous fold over and behind the ear. The skin is smooth with small tubercles on the back and legs. The ground color of the Bullfrog is either green, yellowish green or greenish brown. The back and sides are marked with blotches of large size, which may either be discrete or run together. These spots, which are usually a dark brown, form bands on the limbs. The belly is whitish or grayish more or less mottled with a darker color.

Range: North America east of Rocky Mountains except extreme southeast and Gulf States coastal plain. Introduced in many localities in North America and Cuba.

Remarks: This frog has been collected and observed in many places within the twenty mile radius of this study. It has been recorded from all of the Patapsco State Park and vicinity, Gunpowder Falls region, Loch Raven, Herring Run Park and Swamp, Druid Hill Park, Hillsdale Park, Western Run Parkway, Cherry Hill, Brooklyn, Curtis Bay, Crownsville, Texas, Glen Burnie, Phoenix, Towson, Catonsville, Middle River Region, Camp Linstead, near Shore Acres along the Magothy River, Arbutus, etc. In fact in every large pond of fair size and slow moving river that can furnish haven, this frog can be found.

18. Rana clamitans Latreille

Green Frog, Spring Frog, Small Bullfrog, Hop-frog, Pond Frog, Bullfrog

Description: This smaller frog is often mistaken for the Bullfrog. Adults of this species are much smaller, however, attaining a size of two to four inches. Two prominent ridges or dorsolateral folds extend down the back, and a large fold is present behind the ear. The hind feet are well webbed. The tympanum is almost twice as large as the eye in males, but smaller in females. The skin is smooth with small tubercles on the legs and back. The female Green Frog is noticeably larger, as is true of other Maryland Frogs. The female's head and anterior part of the back is usually beautiful metallic green in color, while in the male frog, these parts are yellowish green. The male has a yellow throat, while the female has a white throat with dark markings. Posteriorly the back in both sexes is usually olive brown, brown, dark brown, or almost black. In many specimens there are dark spots on the back. The limbs are brown, with dark spots and bars. Two frogs of this species that appear alike are difficult to find.

Range: Eastern North America, Canada to Florida and Louisiana, west to Michigan, Wisconsin, Minnesota, Illinois, Kansas, Arkansas, and Texas.

Remarks: The Green Frog is the most abundant amphibian found anywhere in and around Baltimore. Every locality mentioned in the key is a habitat for this frog. In this city, this species can be found wherever civilization has not taken over completely, and has been found in every pond or stream examined.

19. Rana palustris Le Conte

Pickerel Frog, Orange-legged Frog, Leopard Frog, Spotted Frog, Blotched Frog, Spring Frog, Meadow Frog, Grass Frog, Pond Frog

Description: This pretty frog reaches a length of two to three inches, depending on whether it is a male or female. From the eyes, extending backwards, two wide folds run to the posterior end of the body. Between these ridges or dorsolateral folds, there are four or more smaller folds. The feet are well webbed. The skin is smooth. The tympanum is smaller than the eye. The ground color of the back is tan or brown. Between the dorsolateral folds, there are two regular rows of more or less square spots or blotches. These blotches are very dark, usually brown and sometimes blackish, and are edged with black. Below the lateral lines, there are two irregular rows of spots. The limbs may be either barred or spotted. From the nostril to the shoulder there is a light line. The anterior ventral surface of the body is white, but the thighs, forelimbs and sides of the body are brilliantly colored with deep yellow or orange.

Range: Hudson Bay south to Arkansas, Kansas, Oklahoma, and Louisiana and all of eastern North America from Gaspesia west to Wisconsin and Minnesota.

Description: This smaller frog is often mistaken for the Bullfrog. Adults of this species are usually half as large, however, attaining a size of two to four inches. Two prominent ridges or dorsolateral folds extend down the back, and a large fold is present behind the ear. The hind feet are well webbed. The tympanum is almost twice as large as the eye in males, but smaller in females. The skin is smooth with small tubercles on the legs and back. The adult Green Frog is noticeably larger, as is true of other Maryland frogs. The female's head and anterior part of the back is usually beautiful metallic green in color, while in the male frog, these parts are yellowish green. The male has a yellow throat, while the female has a white throat with dark vermiculations. Posteriorly the back in both sexes is usually olive brown, brown, dark brown, or almost black. In many specimens there are dark spots on the back. The limbs are brown, with dark spots and bars. The tadpoles of this species and [illegible] are difficult to tell.

Range: Eastern North America, Canada to Florida and Louisiana, west to Michigan, Wisconsin, Minnesota, Illinois, Kansas, Arkansas, and Texas.

Remarks: The Green Frog is the most abundant aquatic frog anywhere in and around Baltimore. Every locality mentioned in the key is a habitat for this frog. In this city, this species can be found wherever civilization has not taken over completely, and has been found in every pond or stream examined.

13. Rana palustris Le Conte

Pickerel Frog, Orange-legged Frog, Leopard Frog, Spotted Frog, Blotched Frog, Spring Frog, Meadow Frog, Grass Frog, Pond Frog.

Description: This pretty frog reaches a length of two to three inches, depending on whether it is a male or female. From the eyes, extending backwards, two white folds run to the posterior part of the body. Between these ridges or dorsolateral folds, there are four or more squarish dark spots. The feet are well webbed. The skin is smooth. The tympanum is smaller than the eye. The ground color of the back is tan or brown. Between the dorsolateral folds, there are two regular rows of more or less square spots, or blotches. These blotches are very dark, usually brown and outlined, bordered, or ringed with white. Below the lateral lines, there are two less regular rows of spots. The lines may be either broken or unbroken. From the nostril to the shoulder, there is a light line. The ventral surface of the body is white, but the thighs, forelimbs and sides of the body are brilliantly colored with deep yellow or orange.

Range: [illegible] south to Arkansas, Kansas, Oklahoma, and Louisiana and all of eastern North America from Ontario south to Alabama and Mississippi.

Remarks: Almost as abundant as the Green Frog, the Pickerel Frog is found in the same localities. It is found in practically every portion of the radius, both in and out of Baltimore, and specified places need not be mentioned.

20. Rana pipiens Schreber

Leopard Frog, Spring Frog, Meadow Frog, Spotted Frog, Land Frog, Blotched Frog, Yellow-bellied Frog, Grass Frog, Green Frog

Description: The slender, smooth skinned Leopard Frog reaches a length of two to four inches. The head is narrow and long, and the eye is about the size of the ear. The feet are well webbed, and the legs are long. The dorsolateral folds extend down the back from the eyes with two less prominent dorsal folds between them. The ground color varies from metallic green, yellow, yellowish brown to brown. The spots, which are dark brown or black, are more or less rounded, and run irregularly in rows down the back, and are variable on the sides. The limbs are banded and spotted. The entire ventral surface is whitish or yellowish.

Range: Southeastern New York, southern Connecticut, southeastern Pennsylvania, New Jersey, Delaware, and Maryland southwestward into Texas.

Remarks: The Leopard Frog is less abundant than the Pickerel Frog, but is found everywhere in our locality. While less abundant in some places, they are commoner in others. They travel widely on land in large numbers. Most specimens have been taken in the vicinity of beaches and shores.

21. Rana sylvatica sylvatica (Le Conte)

Wood Frog, Spring Frog, Meadow Frog, Cream Frog, Brown Frog, Tan Frog, Forest Frog, Land Frog, Black-eared Frog, Chicken Frog, Cackle Frog, Pond Frog

Description: These frogs attain a length of about two and one-half inches. The head is elongate and the snout pointed. The tympanum does not exceed the size of the eye. The body is slightly depressed. The skin is smooth, and the dorsolateral folds are conspicuous. The hind legs are long and slender, and the long toes have well formed webs. Usually in the spring, the ground color of this frog is a dark brown or gray. However, in summer, the color changes somewhat to salmon red, orange brown, light grayish brown, or tan. The abdomen is white. A black spot or line is present on the forearm. The most conspicuous mark of this frog is a dark brown or black band that extends from the nostril through the eye, widening about the tympanum and ending above the armpits. A white or silvery line extends from the nostril on the upper jaw, to the forearm. Crossbands are present on the hind legs.

Range: Quebec and Nova Scotia to South Carolina, westward to southern Ontario, and Ohio to Arkansas.

Remarks: To enumerate localities would be needless, since this species is just as common as the preceding frogs. They can be heard and collected in great numbers in the spring of the year in transient pools and ponds, but as this season passes, they are difficult to find, because they wander far from water.

PLATE II

Legend to Figures

REPTILES

Figure 1. Six-lined Racerunner, *Cnemidophorus sexlineatus*, Specimen Illustrated Collected near Sawmill Branch and Old Annapolis Road, Anne Arundel County, About Natural Size

Figure 2. Blue-tailed Skink, *Eumeces fasciatus*, Specimen Illustrated Collected between Belair Road and Harford Road, along the Gunpowder River, Baltimore County, About Natural Size

Figure 3. Queen Snake, *Natrix septemvittata*, Specimen Illustrated Collected at Orange Grove, Patapsco State Forest, Baltimore County, About 1/4 Natural Size

Figure 4. Musk Turtle, *Sternotherus odoratus*, Specimen Illustrated Collected in Western Run Parkway, Baltimore City, About 1/2 Natural Size

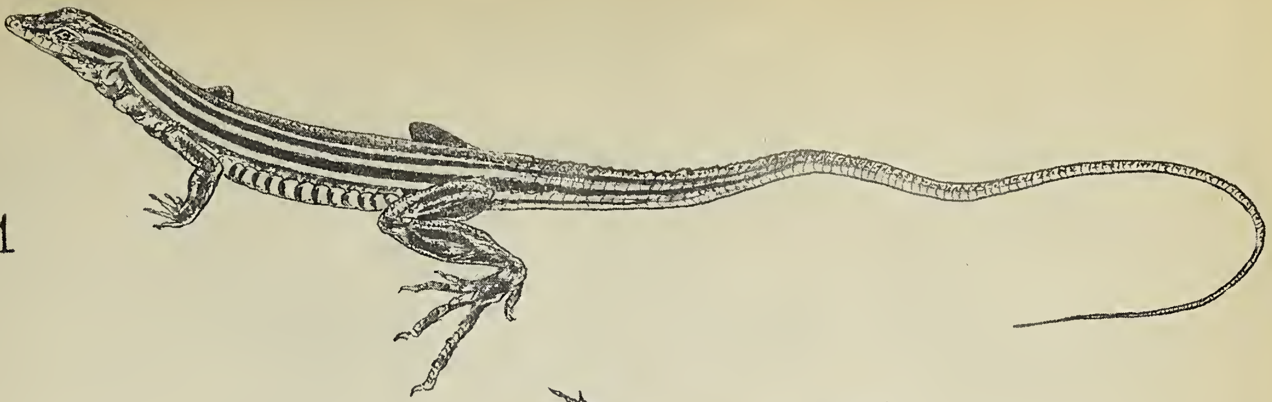
Figure 5. Eastern Ring-necked Snake, *Diadophis punctatus edwardsii*, Specimen Illustrated Collected at Glenartney, Patapsco State Forest, Baltimore County, About Natural Size

Figure 6. Common Milk Snake, *Lampropeltis triangulum triangulum*, Specimen Illustrated Collected near Western High School, Baltimore City, About 1/2 Natural Size

Figure 7. Mud Turtle, *Kinosternon subrubrum subrubrum*, Specimen Illustrated Collected at Herring Run Swamp, Baltimore County, About 1/2 Natural Size

Figure 8. Common Garter Snake, *Thamnophis sirtalis sirtalis*, Specimen Illustrated Collected at Vineyard, Patapsco State Forest, About 1/4 Natural Size

Figure 9. Northern Copperhead, *Agkistrodon mokasen cupreus*, Specimen Illustrated Collected at Ilchester, Pataspco State Forest, About 1/6 Natural Size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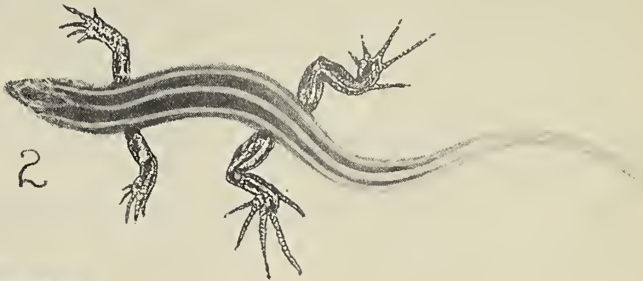
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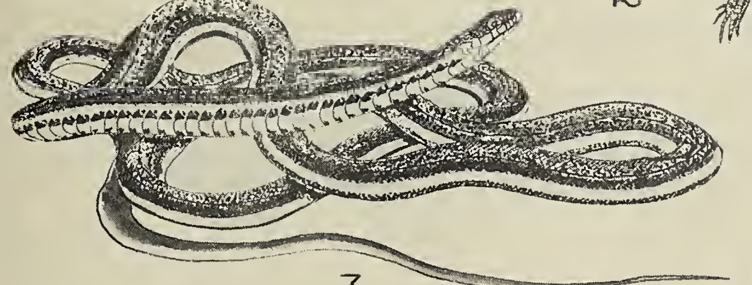
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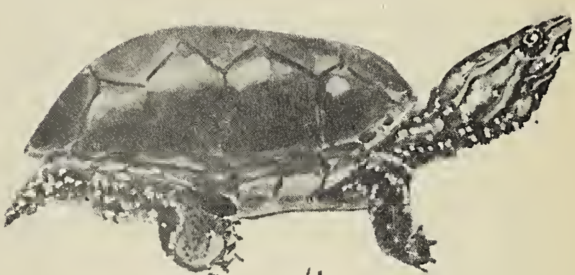
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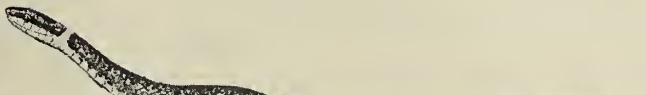
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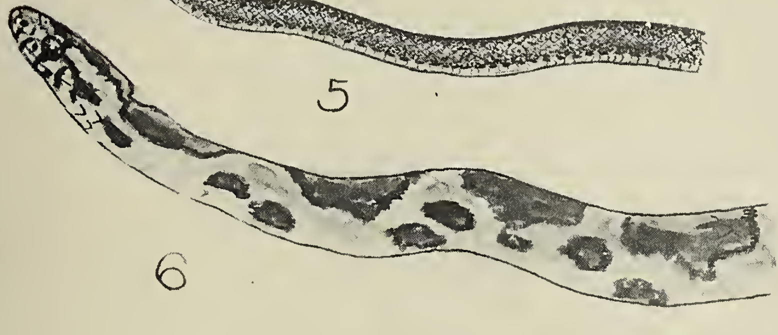
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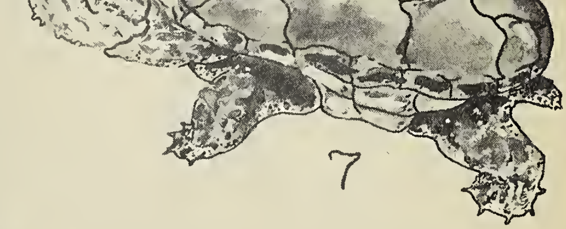
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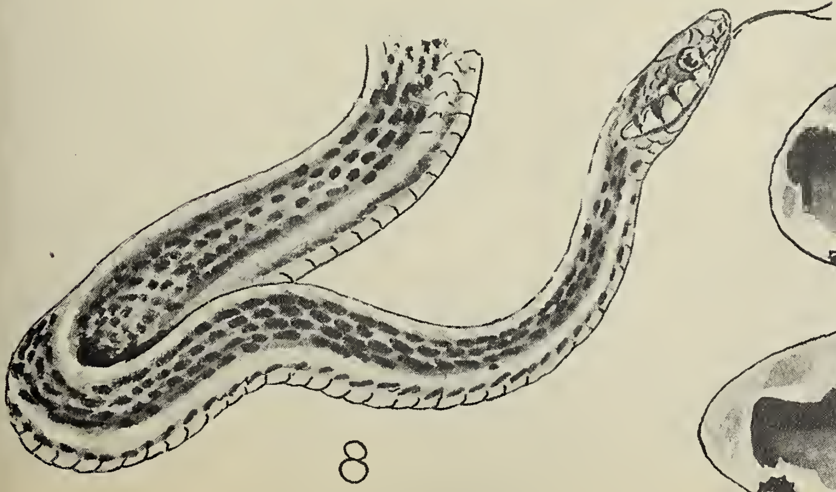
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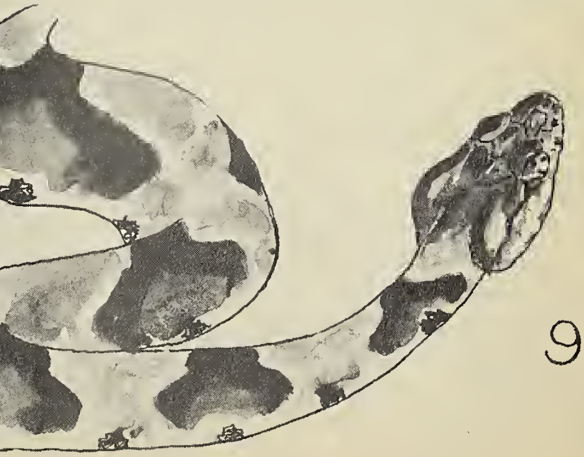
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Class: REPTILIA Laurenti

Reptiles

Subclass: DIAPSIDA Osborn

Order: SQUAMATA Oppel

Scaled Reptiles

Suborder: SAURIA Macartney

Lizards

Family: IGUANIDAE

Iguanid Lizards

Genus: SCELOPORUS Wiegmann

1. Sceloporus undulatus fasciatus (Green)

Fence Swift, Fence Lizard, Pine Lizard, Scorpion, Blue-bellied Lizard, Brown Lizard, Indigo Swift, Scaled Lizard, Spiny Swift, Banded Lizard, Spotted Lizard, Swift

Description: This finely proportioned lizard reaches a length of about seven inches. The head is wider than the neck, the eye is small, the ear is larger than the eye, the head plates are large, and no gular folds are present. The tail is somewhat longer than the head and body, the hind limbs are well developed, larger than the front limbs, and the toes (five on each foot) are very long. The dorsal scales are keeled and spiny, and the scales of the lateral and ventral surfaces are smooth. The males are less brightly marked above than the females, having a ground color dark gray, dark brown, or light brown, while the latter sex has the ground color of brown, light tan, yellow, gray, or almost white. On the female, from the head to the tail, there is a series of black or dark brown wavy crossbands, with a whitish or yellowish stripe behind them; these are absent or obsolete on the male, which has a brilliant blue or bluish black patch on the throat and on each side of the abdomen. The females have a light belly, immaculate except for a sprinkling of dark brown specks. The limbs are striped.

Range: Eastern States, southeastern New York to South Carolina.

Remarks: This very abundant lizard has been taken mostly in the dry regions at all collecting points in the Upper and Lower Patapsco State Parks, everywhere in and about Camp Linstead, Furnace Branch, Fort Armistead, Cherry Hill, Herring Run Park, Crownsville, Fort Smallwood, Glen Burnie, Middle River Region, Gwynn Oak Park, Gunpowder Falls region, Lake Shore, near Shore Acres on the Magothy River, Arbutus, Halethorpe, etc.

Family: TEIIDAE

Striped Lizards or Racerunners

Genus: CNEMIDOPHORUS Wagler

2. *Cnemidophorus sexlineatus* (Linne)

Six-lined Racerunner, Six-lined Lizard, Striped Lizard, Striped Racerunner, Sand Swift, Six-lined Swift, Beach Lizard, Beach Racerunner, Whip-tailed Lizard, Race Horse, Race-nag, Sand Lizard, Sand Scraper, Six-lined Racing Lizard.

Description: This attractive lizard is slender in build and its strong legs are moderately proportioned. The head is long, the snout pointed, the ear is larger than the eye, two prominent gular folds are present. The plates on top of the head are large. The scales of the dorsal portion of the body are small and granular, while those of the ventral surface are large and transversely rectangular. The greatest length attained is about eight inches, of which the tail occupies about five inches. The body is rather cylindrical and the tail is long and tapering. The ground color is a dark greenish brown or black, with six bright dorsal yellow stripes, which reach to about the middle of the tail. A less vivid mid-dorsal line running from the head to the end of the tail often gives the appearance of a seventh stripe. The throat is white, and the belly is bluish (very blue in males) or whitish.

Range: Maryland to Florida, west to northern Mexico and Arizona and up the Mississippi Valley as far north as Lake Michigan.

Remarks: Wherever this lizard is found, it is rather common. Frequenting dry, sandy and pine areas, it has been found collected in colonies in and about Camp Linstead, Furnace Branch, Fort Smallwood, Fairview, near Shore Acres on the Magothy River, Lake Shore, and Bodkin Point. North of these points in Maryland, it is not commonly found.

Family: SCINCIDAE

Skinks

Genus: EUMECES Wiegmann

3. *Eumeces fasciatus* (Linne)

Blue-tailed Skink, Five-lined Skink, Red-headed Skink, Scorpion, Skink, Smooth Lizard, Blue-tailed Lizard, Red-headed Lizard, Blue Skink, Blue Lizard, Brown Skink, Striped Skink, Striped Lizard

Description: This skink reaches a length of about six inches.

The head is of moderate size and hardly distinct from the neck except in adult males. The limbs are well-developed with five toes and claws on each foot. The body is rather robust in adults, but the young are more slender. The tail is slender and tapering and as long as or longer than the body. Young specimens and adult females are dark brown or black above, with five yellow or buff lines or stripes running from the head to the middle of the tail. The middle stripe bifurcates on the head. The stripes on adult females are less vivid than the markings of young specimens. The tail of juveniles, most nearly grown, and some adult female specimens is a bright blue. The stripes on males become obscure as they become full adults, and the general color fades to olive brown or dark brown. The top of the head and the cheeks become a bright red and the head becomes broader in the region of the cheeks, but in the female, the head does not become reddish, and the cheeks do not become swollen.

Range: Southern New England to Florida, up the Mississippi Valley to Canada and westward to Arizona.

Remarks: This lizard has not been found frequently in this area, though quite a few specimens are present in our collections. Only one specimen has been collected in the Patapsco State Park, at Avalon. Others have been taken at Camp Linstead, Furnace Branch, near Middle River, at the Gunpowder Falls at the intersection of Belair Road and Philadelphia Road, Chase, Lake Shore, near Shore Acres along the Magothy River, and possibly at Herring Run. Joseph Bures collected two specimens at the Washington Monument in the center of Baltimore City! Apparently these specimens were brought or liberated at this area, because detailed searching in this thickly-populated locality failed to produce other specimens. This skink prefers the same general localities as the preceding lizards, and has been found with the other species, but usually in moist areas.

4. *Eumeces laticeps* (Schneider)

Broad-headed Skink, Scorpion, Red-headed Skink, Big Brown Skink, Giant Skink, Blue-tailed Skink, Seven-lined Skink, Five-lined Skink, Striped Lizard, Brown Lizard

Description: This large skink which attains a length of ten or twelve inches is the largest lizard in this area. It closely resembles the preceding species in general form but often can be distinguished by size alone. The snout is pointed, the tail is slender and long, and the limbs are well-developed. The tail of the young and of many adult females is a bright blue. Where the stripes are distinguishable, there are seven stripes on a ground color of dark brown or black. The lowest pair of stripes often appears only as a sharp demarcation line between the dark dorsal ground color and the light color of the belly. With increasing age, the dark ground color becomes lighter and the stripes become darker, and in males both colors gradually fuse into a shade of brown. The female retains clearly

indicated stripes throughout life. The male develops a wide fiery red head, and a broad brownish band on the side of its body.

Range: Southeastern States west to Oklahoma. Absent from southern Florida. Very frequently, if not usually arboreal.

Remarks: Infrequently seen because of its wariness, this lizard has come to attention only a few times in Maryland as a whole, and is best known in southern Maryland. However records are from Lake Shore, at Shore Acres near the Magothy River, and Indian Landing. Reports from civilians of "large" red-headed lizards have come from the area near the intersection of the Gunpowder Falls and Belair Road, Camp Linstead, near Arbutus, and Vineyard. The name applied to these lizards is usually "Scorpion". No definite conclusions can be reached about the occurrence of this species at these hypothetical localities, until authentic specimens and records are taken.

Suborder: SERPENTES Linne

Snakes

Family: COLUBRIDAE

Colubrid Snakes

Genus: CARPHOPHIS Gervais

5. Carphophis amoena amoena (Say)

Worm Snake, Spine-tailed Snake, Ground Snake, Brown Snake, Red Snake

Description: This snake may be recognized almost instantly by its small, stout body, and smooth glossy scales. The head is indistinct from the body, and the tail is equipped with a very small, sharp inoffensive spine. The dorsal color is chestnut or pinkish brown, while the ventral surface is salmon or pinkish. Some young individuals are dark above, with a reddish belly, while others are light. This snake generally attains a length of eight to eleven inches.

Range: Connecticut to New York, south to central Florida, and west into the Appalachian Mountains.

Remarks: Because of this snake's burrowing habits, it is not often seen, and for this reason, it appears uncommon. However, it has been collected from Glenartney, Relay, Avalon, Orange Grove, Furnace Branch, Cherry Hill, Camp Linstead, Crownsville, and the Gunpowder Falls area.

Genus: DIADOPHIS Baird and Girard

6. Diadophis punctatus edwardsii (Merrem)

Ring-necked Snake, Collared Snake, Orange-bellied Snake, Ring Snake, Black Snake, Ringed Black Snake, Yellow Collar Snake

Description: This snake reaches a length of nine to sixteen inches. The body is almost cylindrical, the head is flat, slightly distinct from the neck, and the snout is blunt. The dorsal color is a slate black, with a bright orange or yellow belly. The dorsal and ventral colors are separated from each other by a series of black spots, one of which occurs on the end of each ventral plate. Some specimens have a few dots arranged on the middle of the abdomen. A conspicuous yellow or orange ring, two or three scales in width, is found on the neck. The scales are smooth and shiny.

Range: The mountains of the Carolinas through the Appalachians northward to the Northern Peninsula of Michigan, Wisconsin, southern Canada, and the Maritime Provinces.

Remarks: This dainty little snake has been collected frequently at the more uncivilized places throughout the enclosed area. Although rather secretive, this species has been captured at Relay, Avalon, Glenartney, Vineyard, Orange Grove, Ilchester, Oella, and many other points in the Patapsco State Park, Hillsdale, Gunpowder Falls area, Cherry Hill, Western Run Parkway, Camp Linstead, Elkridge, Ellicott City, Catonsville, Towson, etc.

Genus: HETERODON Latreille

7. Heterodon contortrix (Linne)

Hog-nosed Snake, Spreading Adder, Puff Adder, Spread Adder, Blowing Viper, Sand Adder, Hog-nosed Viper, Black Adder, Hissing Viper, Bastard Rattlesnake, Pilot Viper, Death Snake, Pig Snake, Pig-tailed Snake, Spreadhead, Cobra Snake, Opossum Snake, Splotched Adder, Hog-nosed Adder, Hog-nose, Puffing Adder

Description: This much persecuted snake has a wide, stout, short body, and may grow to thirty-five inches in length. The tail is short. The distinguishing character is the sharp upturned snout. The head is somewhat flattened and rather distinct from the body. The ground color may be yellow, brown or gray. The back is marked by a series of black or dark brown blotches which become bands on the tail. On each side of the body is an alternating series of smaller more rounded spots. Some specimens have rich red, orange or auburn on the anterior section of the body. Two elongated black lateral blotches and another between them usually occur along the neck behind the head. There is a dark band between the eyes. The belly is dirty yellow, light orange

Genus [illegible]

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Genus [illegible]

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or gray, depending on the dorsal color. The scales are keeled.

Range: New Hampshire to central Florida westward to Texas and Oklahoma and northward through the states of the Mississippi basin to Minnesota.

Remarks: The Hog-nosed Snake has been observed at Camp Linstead, all through the Patapsco State Park, Gunpowder Falls area, Loch Raven, Catonsville, Ellicott City, Fort Smallwood, Lake Shore, near Shore Acres along the Magothy River, Indian Landing, and many other localities. It seems to prefer the more sandy and pine regions.

Genus: OPHEODRYS Fitzinger

8. Opheodrys aestivus (Linne)

Rough Green Snake, Keeled Green Snake, Green Snake, Green Racer, Green Tree Snake, Tree Snake, Green Whip Snake, Emerald Snake, Whip Snake, Racer, Honey-suckle Snake, Summer Snake

Description: This snake is long and slender, attaining a length of thirty or more inches. The head is narrow and long, and is distinct from the neck. The eye is large, and the tail is long and whip-like. The largest width of this snake is about a half of an inch. The scales are keeled or rough. The color is bright uniform green, varying from bluish green to bright yellowish green. The belly is uniform yellowish white.

Range: Connecticut to Florida, westward to eastern New Mexico, in the southern part of the Mississippi drainage basin, and northward to Kansas, Illinois and Ohio.

Remarks: This snake is well distributed throughout the Baltimore region, especially in the dry pine areas. It has been collected and observed in Clifton Park, Cherry Hill, Relay, Orange Grove, Camp Linstead, Avalon, Arbutus, Curtis Bay, Lake Shore, near Shore Acres along the Magothy River, in the Gunpowder Falls area, Glen Burnie, Druid Hill Park, Texas, Herring Run Park, Crownsville, etc.

Genus: COLUBER Linne

9. Coluber constrictor constrictor (Linne)

Black Racer, Common Black Snake, Smooth Black Snake, Blue Racer, Black Asp, Bird Snake, Racer Snake, Racer, Tree Black Snake, Mountain Racer, Black Snake, Whip Snake

Description: This species usually grows to a length of seventy inches. The head is somewhat distinct from the neck, and the body and tail are slender. The scales are

smooth and large. The color above is usually slate black, but many are blue black, brownish black or coal black. The throat is white and the belly a light slaty gray. The young are marked differently from the adults, having a grayish ground color with a series of rich brown blotches on the back. The sides are marked with dark brown or black dots. As the young mature, these blotches become obscure, and after they usually exceed twenty inches or more, they resemble the adults.

Range: The whole of eastern North America, westward to the Mississippi and Ohio Rivers.

Remarks: The Black Racer is the most common large serpent inhabiting the Baltimore area. It is found in every sort of environment found in this region, and has been found in practically every large park in Baltimore, where the areas have not been too overrun by humans. It is surprising to note that this snake has remained in some localities for numbers of years, despite strong persecution. Outside of Baltimore, people know the "Racer" well, even though they may be devoid of knowledge of other snake-lore.

Genus: ELAPHE Fitzinger

10. Elaphe obsoleta obsoleta (Say)

Pilot Black Snake, Mountain Black Snake, Tree Black Snake, Pilot Snake, Keeled Black Snake, Shiny Black Snake, Black Chicken Snake, Black Rat Snake, Rat Snake, Pilot Rat Snake, Black Mouse Snake, Bird Snake, Egg Snake, Black Egg Snake, Black Constrictor

Description: This is the largest species found in our area, growing over seventy-five inches in length; however, most specimens taken hardly exceed sixty inches. The body of this snake is proportionately stouter than that of the other black snake, and the scales are keeled and smaller. The head is more depressed and wider at the base. There is a stout innocuous spine on the tail. The abdomen is flat and not rounded as the preceding species. The dorsal ground color is shiny black or brownish black. On some of the scales along the entire length of the body, white flecks may be discerned, and on closer observation, these white tips suggest imaginary blotches. This is noticeable after sloughing. The belly differs from that of the Black Racer by being almost entirely white anteriorly. The white is checkered with slate gray or black. Posteriorly, the belly is a uniform slate gray or black. Young specimens, as with the preceding snake, are colored unlike the adults. They have a brownish gray or gray dorsal ground color, with squarish blotches situated along it. As the juveniles mature, the traces of these markings are delimited by the white-tipped scales, and they are gradually obliterated by black.

Range: Southern New England westward to Wisconsin, southern

Ontario, southward to Texas, Louisiana and Florida.

Remarks: Although just as common as the Black Racer, this species is restricted to certain areas within the boundaries set in this article. Most of the individuals have been taken in high, rocky and woody areas. Localities: all through and about the Patapsco State Park, Gunpowder Falls area, Randallstown, Camp Linstead, near Middle River, Woodstock, Glyndon, Texas, near Shore Acres along the Magothy River, Crownsville, etc.

Genus: LAMPROPELTIS Fitzinger

11. Lampropeltis getulus getulus (Linne)

King Snake, Common King Snake, Thunder Snake, Lightning Snake, Chain Snake, Ringed Rat Snake, Chained Rat Snake, Mouse Snake, House Snake, King Rat Snake, Milk Snake, Rat Snake, Cannibal Snake, Pilot Snake, Barn Snake, Black Snake

Description: The pretty King Snake usually reaches about forty-five inches in length. The scales are smooth and shiny. The head is small and blunt; hardly distinct from the neck. The body is stout and rounded, and the tail is short. The ground color of this serpent is black or very dark brown. A series of narrow crossbands of white or yellow are present on the back. These crossbands divide laterally and the branches meet in pairs on the sides to form a lateral series of light spots. These markings form an attractive net or chain like pattern. The abdomen is checkered with white or yellow and black on each ventral plate. The top of the head is black speckled with white or yellow. Each lip scale or labial is white or yellow edged with black.

Range: Southern New Jersey to northern Florida and southeastern Alabama.

Remarks: This snake is probably common throughout the locality, but is rarely taken because of its secretive habits. Specimens are recorded from Cherry Hill, Arbutus, Brooklyn, Avalon, Camp Linstead, Orange Grove, Glenartney, Vineyard, Relay, Elkridge, Furnace Branch, Gunpowder Falls near Belair Road, near Middle River, Lake Shore, near Shore Acres along the Magothy River, Crownsville, Herring Run Swamp, near Glen Burnie, etc.

12. Lampropeltis triangulum triangulum (Lacepede)

Milk Snake, Mouse Snake, Checkered Adder, Cow Snake, House Snake, Barn Snake, Blotched Rat Snake, Red Rat Snake, Red Milk Snake, Ground Snake, Blotched Adder, Spotted Adder, Spotted Snake, King Snake, Corn Snake, Chicken Snake, Red Bird Snake, Lightning Snake, Thunder Snake, Red Snake, Rat Snake, Horn Snake, Brown Milk Snake, Chequered Snake, Milk Adder, Mole Snake, Spotted Viper, Milk Viper

Description: This rather slender snake usually attains a length of about thirty-five inches. It has a small blunt head slightly wider than the neck, and the body is rounded and the tail is short, tapering to a point with an innocuous spine. The scales are smooth and shiny. The ground color is usually some shade of gray, tan or light brown, and along the back is a series of dark brown, brown, auburn, maroon, reddish brown or red black bordered saddle blotches. On the sides, smaller alternating spots are present. The abdomen is whitish with checkered black blotches on each ventral scale. The blotch on top of the head and neck extends longitudinally and surrounds a patch of ground color outlined with black. In front of the eyes is a dark mark, which crosses the head. There is also a dark line from the eye to the corner of the jaw.

Range: Eastern North America from Maine through Ontario to Minnesota, south to Iowa and Virginia and in the mountains farther south.

Remarks: This snake is quite frequently brought to light despite its secretive habits throughout the selected area, and is rather common in Baltimore. In northwest Baltimore, James Leake found a flourishing colony of these serpents with many fine specimens. They have been taken near Western Run Parkway, all through the Patapsco State Park, Gunpowder Falls area, between Harford Road and Belair Road, Essex, Middle River Region, near the Herring Run Swamp, Reisterstown, near Ellicott City, etc.

Genus: NATRIX Laurenti

13. Natrix septemvittata (Say)

Queen Snake, Queen Water Snake, Leather Snake, Moon Water Snake, Moon Snake, Striped Water Snake, Midnight Snake, Lined Water Snake, Yellow-bellied Water Snake, Water Snake, Moccasin

Description: This water snake usually grows to a length of about twenty-eight inches. The head is small and not distinct from the neck, and the tail is rather long. The scales are keeled and rough. The young are slender, but become stouter as they mature. The ground color is dirty brown or chocolate. A light lateral yellow stripe, about two scales in width runs from the head to the tail. Sometimes three faint black stripes are visible on the dorsal surface. They can best be seen on juveniles. The abdomen is yellowish and sometimes whitish anteriorly with two dark stripes along the middle; posteriorly the belly may be dusky and mottled. The chin and lips are yellow. Anteriorly the belly stripes unite and fuse into the neck. These two parallel stripes are composed of small brown square blotches.

Range: Central, eastern and Gulf States from Pennsylvania,

New Jersey, Ohio, and Wisconsin southward to Alabama and Georgia.

Remarks: The Queen Snake is fairly common throughout the Baltimore area. Inhabiting both fast and slow-moving streams, this species has been collected in and about the whole Patapsco State Park, Western Run Parkway, Herring Run Park, Jones and Gwynns Falls, Cherry Hill, Camp Linstead, Furnace Branch, Elkridge, Lansdowne, Phoenix, Reisterstown, and other scattered localities.

14. Natrix sipedon sipedon (Linne)

Banded Water Snake, Water Moccasin, Common Water Snake, Leather Snake, Fish Snake, Eel Snake, Moccasin, Water Snake, Brown Water Snake, Slider, Black Water Snake, Gray Water Snake, Copperhead, Rattlesnake, Water Viper Water Adder, Milk Snake, River Snake

Description: The Banded Water Snake, a species which reaches a length of thirty-six or more inches, is roughly keeled with rugose scales. The head is moderate in size and rather wide, almost triangular, and the tail is moderately long. The general color is tan, brown, or blackish brown. A series of broad irregular reddish brown cross-bands extends down the back. The colors are highly variable and may be black, brown or reddish. On light specimens they are edged with black. The area between the markings varies from light tan or whitish to almost any shade of brown or gray. On dark specimens, the pattern is hardly discernible. The majority of specimens examined were almost uniform black or brown on the posterior portion of the body. Adults have been taken with the juvenile blotched pattern. The belly is yellowish or whitish, with triangular or semicircular markings, which are colored reddish brown or orange brown. Although appearing shabby from a superficial view, in reality this snake is a beautiful reptile.

Range: Southern Maine through southern Quebec, southern Ontario, and Wisconsin to eastern Colorado, south to Oklahoma, Tennessee, and northwestern South Carolina.

Remarks: This species is one of the commonest serpents in the area under discussion. Wherever a stream or river is present, this snake is usually found too. It is found in every environment present in Baltimore and vicinity for twenty miles. As in the case of the Black Racer, Garter and Dekay Snakes, a list of localities will not be enumerated. Were it not for its extreme viciousness, the Banded Water Snake would make an excellent and attractive pet.

Genus: STORERIA Baird and Girard

15. Storeria dekayi (Holbrook)

Dekay Snake, Rock Snake, Brown Snake, Ground Snake, Tan Snake,

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Rough Brown Snake, Garden Snake, Grass Snake, Tar-paper Snake, City Snake, Copperhead, Striped Brown Snake, Worm Snake

Description: This common and harmless serpent reaches a length of ten to sixteen inches. At first sight it appears to be uniform brown. The head is moderately large, and is slightly distinct from the neck. The scales are keeled. The young are rather slender. The general color is either light tan, brown, dark brown or auburn. A dorsal band, lighter than the ground color, extends down the middle of the back. On each side of this stripe, there is a border of small black spots. On each side, behind the head, is a dark brown blotch. Parts of the above pattern may not be visible on some specimens; such individuals are usually either very dark or very light. The abdomen is pinkish or brownish, and sometimes yellowish. Several dark specks may be found on each ventral scale or plate. The young resemble the Ring-necked Snake. They may be considerably darker than matured specimens, and they apparently possess a conspicuous whitish or yellowish neck band, in the form of two light spots behind the jaws.

Range: Eastern North America, Ontario to Vera Cruz, west to Kansas.

Remarks: As abundant as the Banded Water, Garter and Black Racer Snakes, this snake, strange as it seems has been collected in greater numbers in the city and suburbs, than in the surrounding wild territory. Where other snakes have failed in their struggle for existence in the city, this tiny reptile has been successful. In Baltimore City, they have been found in graveyards, parks, lots, gardens, golf courses, dumps, etc. Perhaps the apparent rarity of this form outside of Baltimore in the more rugged localities is due to the fact that it is well-versed in secreting itself. To conserve space, repetition of the localities already known will not be given.

16. Storeria occipitomaculata (Storer)

Red-bellied Snake, Storer's Snake, Brown Snake, Ground Snake, Red Snake, Vermilion-bellied Snake, Red Ground Snake, Worm Snake

Description: The Red-bellied Snake reaches a length of about eleven inches. The body characters are similar to the Dekay Snake. The dorsal surface is a chestnut brown, olive-brown, or gray, with a lighter dorsal stripe, and the belly is a brilliant red or pink. On the back of the head are three whitish spots, which appear as a light ring. The chin is grayish. Some specimens have four longitudinal stripes, darker than the ground color.

Range: From Ontario and Lake Superior southward to Vera Cruz, westward to Kansas, Iowa, and North Dakota.

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Remarks: This snake is rather uncommon in Maryland, and the writer knows of only one specimen reported from the surveyed area. While labeling the herpetological collection of Baltimore City College, the writer found a specimen labeled "Catonsville, 1928".

Genus: HALDEA Baird and Girard

17. Haldea valariae valariae (Baird and Girard)

Valaria's Snake, Smooth Brown Snake, Gray Snake, Virginia's Snake, Worm Snake, Ground Snake, Haldea's Snake, Spotted Ground Snake, Smooth Brown Snake

Description: This snake grows to a length of from eight to twelve inches. For its size, Valaria's Snake is rather stout. The head is scarcely distinct from the neck, and is rather small. The snout is somewhat pointed. The ground color is usually dark brown or gray, and this uniform color is faintly sprinkled with black dots. The belly may be whitish or yellowish. The scales are smooth or very slightly keeled.

Range: New Jersey to South Carolina, west to Ohio and Tennessee.

Remarks: In comparison with some of the more abundant snakes of this area, the Valaria's Snake may be considered rare. However, this dainty snake has been collected at Cherry Hill, near Marley Creek, Gunpowder Falls area, Arbutus and Woodstock.

Genus: THAMNOPHIS Fitzinger

18. Thamnophis sauritus sauritus (Linne)

Ribbon Snake, Slender Garter Snake, Ribband Snake, Eastern Ribbon Snake, Garter Snake, Striped Water Snake, Whip Garter Snake, Whip Snake, Swift Garter Snake, Yellow-striped Whip Snake, Striped Snake, Water Racer, Striped Racer

Description: This fine serpent may be recognized immediately by its slender striped body. It attains a length of twenty to twenty-eight inches. The head is small but very distinct from the neck. The tail is long and slender and the scales are keeled. On a ground color of dark brown or black, three bright yellow stripes extend along the body. The dorsal yellow stripe may have a slightly orange tint. Below the lateral stripes, the ground color is light brown where it touches the bluish or greenish white belly. The lateral stripe is on the third and fourth scale rows, while on the Garter Snake it is on second and third rows.

Range: Michigan, Ontario, and Maine, south to Mississippi, Alabama, and Georgia.

Remarks: Because of its extreme wariness, this snake is rarely collected. It inhabits swamps, moist meadows, streams and rivers in our area, and has been collected and observed at all points in the Patapsco State Park, Gunpowder Falls area, Cherry Hill, Brooklyn, Gwynns Falls Park, Herring Run Park, Lansdowne, Furnace Branch, Camp Linstead, Loch Raven, Randallstown, etc.

19. Thamnophis sirtalis sirtalis (Linne)

Garter Snake, Garden Snake, Common Garter Snake, Striped Snake, Spotted Garter Snake, Blue Spotted Garter Snake, Water Garter Snake, Fish Snake, Frog Snake, Ribbon Snake, Yellow-striped Snake, Striped Moccasin, Striped Water Snake

Description: This snake usually grows to a length of sixteen to thirty-six inches. The body is stout in the adults, but slender in juveniles. The head is moderately large and is distinct from the neck. The scales are keeled. The ground color is variable and may be brown, dark brown, greenish brown, olive, or black. Three dorsal yellow or greenish stripes are present on these snakes as in the Ribbon Snake. These stripes are highly variable and on some specimens, the lateral stripes are obscure, while on others they are very brilliant. On some, the dorsal stripe is hardly visible, while others have a bright orange medium stripe. Sometimes these stripes are broken up in such a way that they appear to fuse with the dark ground color, resulting in a spotted appearance. Some Garter Snakes have a beautifully checkered pattern. The ventral surface is greenish, bluish or yellowish. When first viewed some individuals give the appearance of uniform green, while others yellow; a few are almost black.

Range: Eastern United States and Canada, north to about the 52nd degree of latitude, west to Minnesota, Wisconsin, Missouri, southward to eastern Texas.

Remarks: This pretty serpent seems to be more abundant in the urban than the rural areas. It is usually found with the Dekay Snake; however, it is found in equal abundance in wilder sections, which seem devoid of the latter species. A list of localities is unnecessary.

Family: CROTALIDAE

Pit-vipers

Genus: AGKISTRODON Beauvois

20. Agkistrodon mokason cupreus (Rafinesque)

Copperhead, Highland Moccasin, Chunkhead, Pilot Snake, Hazelhead, Red Viper, Copper-belly, Copper Snake, Deaf Adder, Copperhead Snake, Cotton Mouth, Popular Leaf, Popular Snake, Cicada Viper, Mouse Snake, House Viper, Rock Adder, Sleeping Snake, Poison Snake, Copper Moccasin

Description: The only poisonous reptile found in our area grows to a length of forty inches. This brightly colored, but dangerous snake, is stoutly built, and the head is wide, flat and very distinct from the neck, and the tail is short. The scales are keeled. The ground color is hazel brown, sometimes almost orange. Superimposed on this are dark chestnut brown transverse, saddle-shaped blotches. These are narrower and are usually on the median dorsal line. Within the wider parts of these blotches, the color may be as light as the ground color. The hour glass blotches may be outlined with a light color. Many individuals are marked with small dark spots between and in the blotches. The head is reddish coppery. The general color of the abdomen is either yellowish or pinkish, and is marked on the sides with dark brown or black blotches. A line from the nostril to the eye through to the corner of the mouth separates the copper head from the cream colored lips and sides of the head. The young are lighter than the adults, but the tail is tipped with bright yellow.

Range: Eastern Oklahoma and eastern Kansas; higher areas of west central and northwestern Arkansas, Missouri (except southeastern portion), north to central Illinois, central Indiana, southern and eastern Ohio, Pennsylvania, and southeastern New York; Appalachian highlands from the Tennessee River and northeastern Alabama to eastern Massachusetts.

Remarks: Where this handsome venomous snake is found, it abounds in large numbers, but because of its retiring habits specimens are rarely seen by the average person. It is one of the most common snakes in the Patapsco State Park and vicinity, Gunpowder Falls area from Loch Raven to Philadelphia Road, Texas, Glyndon, Woodstock, Reisterstown, Crownsville, Texas, Elkridge, Lake Shore, near Shore Acres along the Magothy River, near Middle River, near Granite, etc. In Baltimore City, one specimen was killed near St. Mary's Seminary by a boy interested in snakes. It has been reported by people in the more rugged portions of Gwynns Falls Park, Curtis Bay, Herring Run Park, and Hillsdale Park, but these records need confirmation.

Subclass: SYNAPSIDA Osborn

Order: TESTUDINATA Oppel

Turtles

Family: KINOSTERNIDAE

Stink-pot Turtles

Genus: STERNOTHERUS Gray

21. Sternotherus odoratus (Latreille)

Musk Turtle, Stink-pot Mud Terrapin, Mud Turtle, Slider, Skil-

pot, Bottom Turtle, Stink-pot Turtle, Musk Terrapin, Striped Turtle, Yellow-striped Turtle

Description: The shell of this turtle attains a length of about five inches. The carapace is narrow, oval and smooth surfaced. The posterior portion of the carapace is highly arched and the margin is turned sharply downward. The plastron is small and cross-shaped, and does not cover the soft parts. Although it bears two hinges it is too small and inflexible to completely protect the lower surface. Adults seldom have the pronounced dorsal keel characteristic of the young. The head is large and tapering, the snout is conical and the jaws are strong. The tail is short and in males bears a curved nail-like horny appendage. Female specimens have an even shorter tail tipped with a weak horny spine. The feet are small and toes webbed. The skin of the neck bears many pointed fleshy tubercles. The carapace may be either a dark brown, gray, or black, and in some light specimens has dark blotches. Sometimes algae growing over the entire upper shell, give it a greenish appearance. The plastron is brownish yellow. The head is brown with two conspicuous yellow stripes on each side both starting at the nostrils and extending on either side of the eye to the neck. In very old specimens, these stripes may be lacking.

Range: Eastern and southern North America from Canada south; west to southeastern Kansas, Oklahoma and southern Texas.

Remarks: Because of its extreme aquatic habits, the Musk Turtle is rarely recorded. However, it is common, having been collected near Western Run Parkway, Cherry Hill, Herring Run and Gunpowder Falls Swamp, Glenartney, Towson, and near Ellicott City.

Genus: KINOSTERNON Spix

Kinosternon subrubrum subrubrum (Lacepede)

Mud Turtle, Stink-pot, Mud-digger, Mush Turtle, Stink Turtle, Musk Turtle, Swamp and Marsh Turtle, Slider, Skil-pot, Stink Terrapin, Bottom Turtle, Yellow-headed Turtle

Description: Growing to a length of four or five inches, this turtle somewhat resembles the Musk Turtle. The carapace is rather elongate and narrow and is highest and turned down sharply at the posterior portion. The plastron is nearly large enough to cover the whole lower body and bears two hinges. The young of the Mud Turtle have three weak longitudinal keels. The toes are well webbed. The carapace may be light tan, dusky brown, reddish brown or dark brown in ground color, while the plastron is yellow or brown. The head and neck are brown with yellow or whitish yellow mottled spots. The limbs are light brown, with profusely scattered small dots.

Range: Eastern United States from Connecticut south, ex-

clusive of peninsular Florida, west to Indiana, Illinois and Tennessee.

Remarks: This turtle is more common than the Musk Turtle, and has been collected in Herring Run and Gunpowder Falls Swamp, at Glenartney, Western Run Parkway, Herring Run Park, Cherry Hill, Towson, Randallstown, Catonsville, Camp Linstead, Furnace Branch, Lake Shore, near Shore Acres along the Magothy River, Gwynns Falls Park, Gwynn Oak Park, Elkridge, Glen Burnie, etc. Although just as aquatic as the Musk Turtle, this species has been commonly found on land.

Family: CHELYDRIDAE

Snapping Turtles .

Genus: CHELYDRA Gray

23. Chelydra serpentina (Linne)

Snapping Turtle, Snapper, Loggerhead, Alligator Couta, Couter, Serrated Tortoise, Snake Turtle, Alligator Turtle, Soup Turtle, Land Turtle, Bird-eating Turtle, Snapping Tortoise

Description: The carapace of this turtle has three blunt keels and is highest in front. The keels are very pronounced in the young. The plastron is small and cross-shaped, offering little protection to the soft parts. The tail is very long with a crest of horny tubercles. The head is exceptionally large, and the jaws are strongly hooked and very powerful. The carapace is strongly serrated at the posterior edge. The neck is very long; and when the head, tail and shell are stretched, they sometimes exceed a yard in length. The shell itself frequently measures about fifteen or sixteen inches in length. The head cannot be completely retracted within the shell as in other turtles. The toes are webbed. The carapace is either dark olive, black, or brown. It may be greenish because of algae, which adhere to the carapace of many of our native turtles. The plastron is pale yellow or light brown. The color of the exposed anatomy is brown, faintly sprinkled with small yellow spots.

Range: Eastern North America, except peninsular Florida, from southern Canada and Nova Scotia to the Gulf of Mexico and west to the Rocky Mountains.

Remarks: It is unnecessary to repeat a list of localities for this abundant reptile. All likely environments - streams, ponds, rivers, lakes, swamps, marshes, artificial bodies of water, etc., - in and out of the city have been examined and usually this turtle has been observed. They are able to live in polluted bodies of water. Many are captured and eaten by people.

Family: TESTUDINIDAE

Pond Turtles

Genus: CLEMMYS Ritgen

24. Clemmys guttata (Schneider)

Spotted Turtle, Speckled Turtle, Yellow Spotted Turtle, Pond Turtle, Spotted Terrapin, Speckled Terrapin, Speckled Back, Land Turtle, Black Turtle, Orange Terrapin

Description: Averaging in length from four to five inches, this pretty turtle has a carapace which is ovate, depressed, smooth and unkeeled. The marginal shields are flaring, and are not serrated in the rear. The tail is about an inch long. The plastron in this turtle, as in several others, is concave in the males and flat in the females. The toes are slightly webbed. The carapace is either a very deep brown or black, and is covered with conspicuous yellow and orange spots with no apparent special arrangement. The plastron is yellow or orange blotched with black. The head is black above with a few spots anteriorly and a much larger blotch above the region of the ear. The lower surface of the fleshy parts is bright orange or salmon colored. The limbs and tail are black, speckled with yellow. The female's jaws and throat are orange or yellow, while that of the male is black sprinkled with yellow dots.

Range: Eastern North America from Canada and Maine to northern Florida; in northern part west to Wisconsin and north to southern Michigan and Ontario.

Remarks: This is another rather common reptile native to our area. It has been recorded at Herring Run Park, Gunpowder Falls area, Western Run Parkway, Druid Hill Park, Gwynns Falls Park, Gwynn Oak Park, Loch Raven, Relay, Glenartney, Oella, Hillsdale, Lake Shore, near Shore Acres along the Magothy, near Harmans, Texas, near Woodstock, Camp Linstead, Towson, Randallstown, Reisterstown, Catonsville, Crownsville, etc.

Genus: TERRAPENE Merrem

25. Terrapene carolina (Linne)

Box Turtle, Box Tortoise, Yellow-splotched Tortoise, Tortoise, Dry-land Turtle, Land Turtle, Chequered Turtle, Locked Turtle, Carolina Tortoise, Carolina Box Turtle, Land Terrapin, Box Terrapin, Toad-stool Turtle, Block Turtle, Tortoise Shell, Spotted Turtle

Description: The length of this highly colored turtle is about six inches. The carapace is highly arched, ovate or globular, and is not serrated at the rear. The marginal shields are usually flared. The keel, which is slight or

absent in the adults, is especially prominent in juveniles. The plastron is divided by a single transverse hinge. Because of the size of the plastron, this turtle is able to completely enclose itself within its shell. The toes are not webbed. The ground color may be black or brown with orange and yellow vertical blotches upon it. The markings are distributed alike in no two specimens. The head may be either pale yellow or brownish red. The limbs and small tail are brown with orange and yellow streaks upon them.

Range: Eastern United States from Maine to Georgia, west to Tennessee, southern Illinois, and northwards to southern Wisconsin and central Michigan.

Remarks: This common reptile is found in such great numbers in so many diversified places, that it would be useless to enumerate those of which we have records. They are common in Baltimore City as well as out. Specimens are continually being found wandering through alleys and streets in Baltimore, and doubtless they are the victims of pet lovers, who bring in these turtles from the woods to be used in exterminating garden and cellar pests. Many escape and are liberated. They often wander within the city limits. Box Turtles are frequently crushed to death on roads and highways.

Genus: PSEUDEMYS Gray

26. Pseudemys rubriventris rubriventris (Le Conte)

Red-bellied Terrapin, Potter, Skil-pot, Cooter, Red Cooter, Slider, Red-bellied Cooter, Pond Terrapin, Barred Terrapin, River Terrapin, Swamp Turtle, Red-bellied Turtle, Painted Terrapin, Snapper, Brown Turtle, Red Terrapin

Description: The characteristics are like those of the preceding species. The carapace is mottled olive or brown with irregular wavy lines and bands extending laterally over the back. These bands are red or black. The plastron is reddish. A red central band is present on the marginal shields. The species attains a length of twelve inches. The ground color of the head, neck, tail, and limbs is brown. Red and yellow stripes extend along the head and neck in a parallel fashion, and the limbs are marked with red bands. The toes are webbed.

Range: Atlantic coast from northeastern Florida to Long Island, New York.

Remarks: A twelve inch specimen was reported crushed on Smith Avenue in northwest Baltimore, near McMahon Quarry, and was recorded by a person who referred specifically to its red belly. Several specimens were noted below the dam of the Patapsco River at Glenartney. Another was seen in this river at Vineyard. Several large terrapins of this genus have been seen in various ponds and quarries in northwest Baltimore, but whether they were Red-bellied or Barred

Terrapins or not is not known because no specimens were actually collected and observed closely. The same condition is noted for large terrapins observed in the Herring Run Swamp. Many Painted Terrapins (Chrysemys p. picta) are collected with reddish-stained bellies, but they can readily be identified. Often very large Painted Terrapins are mistaken for Red-bellied Terrapins. Concentrated collecting and study of Maryland turtles will increase our knowledge of this species.

27. Pseudemys scripta troostii (Wied)

Cumberland Terrapin, Red-eyed Terrapin, Slider, Cooter, Skilpot, Tarrapin, Mississippi Terrapin, Painted Terrapin, Green Terrapin, Red-necked Terrapin, Barred Terrapin, Red-eyed Cooter, Spotted Terrapin, River Terrapin, Troost's Terrapin, Turtle

Description: The characteristics of this turtle, which may attain a length of twelve inches, are similar to those of the other turtles of the genus Pseudemys, although the rear of the carapace is only slightly serrated. Young specimens are marked with complicated bright green transverse and reticulated lines. The males are always darker, sometimes nearly black. The most common color of the carapace is olive-green, green or brown, with black, yellow, and light green bands extending laterally from the median line of the carapace. The marginal shields are marked in a like manner with bands of yellow and black. The plastron is yellow, and on each plate there is a blotch which consists of two black circular lines one within the other. These spots enlarge and fuse with age. The ground color of the head is green with yellow stripes or lines which are concentrated or are more abundant on the top of the head with fewer on the throat and sides. On each side of the head, a bright red band extends backwards to the end of the neck. The tail and limbs are striped with yellow.

Range: Mississippi basin north to Kansas, Iowa, northern Indiana and Illinois, southeastern Ohio, Tennessee, south through Louisiana and Texas to the Gulf and northeastern Mexico.

Remarks: This terrapin is not indigenous to Maryland, but it has been taken enough times to suggest that eventually it may become naturalized in and around the State if there are suitable ecological conditions. Young specimens are sold by the thousands in pet shops and department stores, and certainly many have been liberated. A number have been taken in south Baltimore, near Cherry Hill by Frank Groves, and an adult was taken in the lake at Glenartney in the Patapsco State Park. One was found shot near the vicinity of McMahon Quarry in northwest Baltimore.

Genus: CHRYSEMYS Gray

28. Chrysemys picta picta (Schneider)

Painted Terrapin, Painted Turtle, Soldier Turtle, Yellow-bellied Terrapin, Chequered Terrapin, Mud Terrapin, Tarrapin, Mud Turtle, Pond Terrapin, Lake Terrapin, Skil-pot, Cooter, Slider, Yellow-eyed Cooter, Bucket Turtle, Red Turtle, Yellow-necked Terrapin, Striped Terrapin

Description: The carapace is depressed, ovate, without a keel, smooth and non-serrated. The plastron is immovable. The toes are well webbed. It may reach a length of six inches. The back is dark olive green, greenish brown, or brownish black, and each scute is margined with pale yellow. Within each marginal shield there are two or more curved red markings which are marked with black streaks. The belly is bright yellow, and an occasional specimen may have a slight dark blotch upon it. The head is dark olive with two large lemon yellow or white spots on each side of the head behind the eyes. The sides of the head and throat are marked with numerous yellow stripes, which become red at the base of the neck. The limbs are dark with red stripes.

Range: Eastern North America from New Brunswick and Florida.

Remarks: This beautiful terrapin is very common in our area, but is difficult to capture. Restricted to still and very slow-moving bodies of water, it has been taken and observed in Druid Hill Park, Herring Run Park and Swamp, Gunpowder Falls region and Swamp, Western Run Parkway, Gwynns Falls Park, Gwynn Oak Park, Cherry Hill, Glenartney, Towson, Camp Linstead, Pimlico, Crownsville, Texas, Woodstock, Furnace Branch, Loch Raven, Bare Hills, Lake Roland, Lake Shore, near Shore Acres along the Magothy River, Hillsdale, Harmans, etc. In fact it can be observed in any large natural pond or lake in Maryland.

BIBLIOGRAPHY

Agassiz, Louis

1857 - Contributions to the natural history of the United States of America - Little, Brown and Co., Vol. II. pp. 451-643 - pls. 1-27 -(This wonderful work is on American Turtles).

Anonymous:

1929 - January, April, July, October - The Horned Toad in Maryland - Vol. 8 - No. 4 - p. 6 - Quarterly Bulletin - Maryland Academy of Sciences.

1929 - January, April, July, October - Do Snakes take Milk from Cows - Vol. 8 - No. 4 - p. 14 - Quarterly Bulletin-Maryland Academy of Sciences.

Babbitt, Lewis Hall

1937 - The Amphibia of Connecticut - Conn. Geol. & Nat. Hist. Sur. Bull. 57 - pp. 1-50 - 35 photos.

Babcock, Harold L.

1919 - Turtles of New England - Mem. Boston Soc. Nat. Hist. Vol. 8 - No. 3 - pp. 325-431 - pls. 17-32 (colored).

1929 - July - The Snakes of New England - Boston Soc. Nat. Hist. - Nat. Hist. Guide No. 1 - pp. 1-31 - 12 colored figs.

1938 - November - Field Guide to New England Turtles - Boston Soc. Nat. Hist. - Nat. Hist. Guide No. 2 - pp. 1-56 - 18 colored figs.

Bishop, Sherman C.

1927 - The Amphibians and Reptiles of Allegany State Park - New York State Museum - Handbook 3 - pp. 1-141 - 58 figures and photos. 1 map.

1933 - December - The nests and young of the Allegheny Salamander *Desmognathus fuscus ochrophaeus* (Cope) - Copeia - No. 4 - pp. 194-198 - 5 figs.

Bishop, Sherman C. & Schmidt, F.J.W.

1931 - June - The painted turtles of the genus *Chrysemys* - Field Mus. Nat. Hist. - Zool. Ser. - Pub. 293 - Vol. 18- No. 4 - pp. 123-139 - 27 figs.

Blanchard, Frank N.

1921 - A revision of the King Snakes: Genus *Lampropeltis* - U.S. Nat. Mus. Bull. 114 - pp. 1-260 - 78 figs.

1923 - The Snakes of the genus Virginia - Pap. Mich. Acad. Sci., Arts and Lett., Vol. 3 - pp. 343-365 - fig. 10-15.

1939 - A key to the Snakes of the United States, Canada, and Lower California - University of Michigan - Reprint of 1925 - pp. 1-65 - 78 figs.

Brimley, C.S.

1917 - May - The Two Forms of Red Spelerpes Occurring at Raleigh, N. C. - Vol. 30 - pp. 87-88 - Proc. Biol. Soc., Washington.

Burt, Charles E.

1928 - August - The Lizards of Kansas - Trans. Acad. Sci. St. Louis - Vol. 26 - No. 1 - pp. 1-85 - 14 maps.

1931 - A Study of the Teiid Lizards of the Genus Cnemidophorus with Special Reference to Their Phylogenetic Relationships - U.S. Nat. Mus. Bull. 154 - pp. 1-286 - 38 figs.

1935 - A key to the Lizards of the United States and Canada - Trans. Kansas Acad. Nat. Sci. - Vol. 40 - pp. 349-366.

1938 - The Frogs and Toads of the Southeastern United States - Trans. Kansas Acad. Nat. Sci. - Vol. 41 - pp. 331-367 - 14 figs.

The Lizards of the Southeastern United States - Trans. Kansas Acad. Nat. Sci. - Vol.

Cahn, Alvin R.

1937 - August - The Turtles of Illinois - Ill. Biol. Mono. - Univ. Ill. - Vol. 16 - Nos. 1 & 2 - pp. 1-218 - 31 plates - 15 text figs. - 20 tables - 20 maps.

Clay, William M.

1938 - December - A Synopsis of the North American Water Snakes of the Genus Natrix - Copeia - No. 4 - pp. 173-182.

Cohen, Elias

1936 - August - One of Maryland's most Common Snakes - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 6 - No. 12 - pp. 70-72 - Fig. 1.

1936 - October - A key to Maryland Turtles we should know - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 1 - No. 2 pp. 4-6.

1937 - October - A Two-headed Snake - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 8 - No. 2 - pp. 9-10 - 1 fig.

1939 - September - An Observation on the vivacity of the Snapping Turtle (*Chelydra serpentina*) - Nat. Hist. Soc. Maryland - Senior Bull. Vol. 10 - No. 1 - pp. 10-11.

1939 - August - An Observation on the Economic Value of the Pilot Blacksnake, *Elaphe obsoleta obsoleta* (Say) - Nat. Hist. Soc. Maryland - Senior Bull. Vol. 9 - No. 12 - pp. 111.

Conant, Roger

1938 - July - The Reptiles of Ohio - American Midland Naturalist - Vol. 20 - No. 1 - pp. 1-200 - 63 photos. - 13 figs. - 38 maps.

Cope, Edward Drinker

1889 - The Batrachia of North America - U.S. Nat. Mus. Bull. 34 pp. 1-525 - pl. 1-96 - figs. 1-119.

1900 - The Crocodilians, Lizards, and Snakes of North America - Report U.S. Nat. Mus. for 1898 - pp. 153 - 1294 - Figs. 1 - 347 - pl. 1-36.

De Sola, C. Ralph

1931 - September - October - The Turtles of the Northeastern States - New York Zool. Soc. - Vol. 34 - No. 5 - pp. 129-160 - 43 photos.

Dickerson, Mary C.

1906 - The Frog Book, North American Toads and Frogs with a study of the Habits and Life Histories of those of the Northeastern States - Doubleday, Doran and Co. - pp. 1-253 - 16 colored pl. - 38 photos.

Ditmars, Raymond Lee

1929 - The Serpents of the Northeastern States - New York Zool. Soc. - pp. 1-40 - 3 colored plates - 38 photos.

1936 - The Reptiles of North America - Doubleday, Doran and Co. pp. 1-472 - 8 colored pl. - many photos.

Dunn, Emmett Reid

1936 - January - List of Virginia Amphibians and Reptiles - Haverford, Pa. - Haverford College - pp. 1-5.

1926 - The Salamanders of the Family *Plethodontidae* - Smith College Ann. Pub. - Vol. 7 - pp. 1-441 - 2 pl. - 11 figs. 86 maps.

1937 - February - The Status of *Hyla evittata* Miller - Proc. Biol. Soc. Washington - Vol. 50 - pp. 9-10.

1938 - December - Notes on the Frogs of the Genus *Acris* - Proc. Acad. Nat. Sci. Philadelphia - Vol. 90 - pp. 153-154.

Eichhorn, Henry C.

1940 - April - A Note on the Resistance to Dessication of the Toad - Nat. Hist. Soc. Maryland - Junior Bulletin - Vol. 4 - No. 2 - p. 49.

Fowler, Henry W.

1914 - September - Some Amphibians and Reptiles of Cecil County, Maryland - Copeia - No. 22 - pp. 37-40.

1925 - August & September - Records of Amphibians and Reptiles for Delaware, Maryland and Virginia - Copeia - Nos. 145 & 146 - 57-67

Fowler, James A.

1940 - July - A Note on the Eggs of *Plethodon glutinosus* - No.2 Herpetological Notes - Copeia - p. 133.

Gadow, Hans

1901 - Amphibia and Reptiles - Macmillan & Co. - pp. 1-668 - 181 figs.

Gronberger, S. M.

1915 - Copeia, No. 24 - pp. 54-55.

Green, N. Bayard and Neil D. Richmond

1940 - July - Two Amphibians New to the Herpetofauna of West Virginia - No. 2 - p. 127 - Copeia.

Groves, Francis

1936 - December - The Common Blacksnake (*Coluber constrictor constrictor*) Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 1 - No. 4 - pp. 11-13.

1940 - January - The Reptiles of Cherry Hill - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 4 - pp. 1-6 - 2 figs.

Hay, W. P.

1902 - Proc. Biol. Soc. Washington - Vol. 14 - pp. 127-141.

Holbrook, John Edwards

1842 - North American Herpetology - J. Dobson - Philadelphia - Vol. 1 - 4. Many excellent colored plates.

Hopkins, Howard H.

1890 - May - Observations on the Copperhead Snake, *Ancistrodon*

contortrix - Maryland Acad. Sci. - pp. 89-96.

Hurter, Julius Jr.

1911 - July - Herpetology of Missouri - Trans. Acad. Sci. St. Louis - Vol. 20 - No. 5 - pp. 59-274 - pl. 18-24.

Keim, T. D.

1914 - January - Amphibians and Reptiles at Jennings, Maryland - Copeia - No. 2 - Page 2.

Kelly, Howard A.

1899 - December - The Recognition of the Poisonous Serpents of North America - The Johns Hopkins Hospital Bulletin - No. 105 - pp. 1-11 - Painted plates 1-10.

Kelly, Howard A., Davis, Audrey W., & Robertson, Harry Charles

1936 - Snakes of Maryland - Natural History Society of Maryland - pp. 1- 103 - 22 colored pl. - photos., 2 figs.

Klingel, Gilbert

1932 - June - Frog Photography - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 2 - No. 10.

Lamson, George Herbert

1935 - Reptiles of Connecticut - Conn. Geol. & Nat. Hist. Sur. Bull. 54 - pp. 1-35 - 29 photos.

Leake, James

1938 - July - The Milk Snake in Nature - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 2 - No. 3 - pp. 33-34-36.

McAtee, W. L.

1918 - Bull. Biol. Soc. Wash. - No. 1 - pp. 44-46.

Mansueti, Romeo

1938 - April - Observations on the Horned Lizard and Fence Swift in Captivity - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 3 - No. 2 - pp. 24-27 - 4 figs.

1939 - January - Reptiles Noted During 1938 In and Around the Patapsco State Park - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 3 - No. 1 - pp. 5-11 - 3 pls. with 14 hand-colored figs.

1939 - July - Amphibians Noted During 1938 In and Around the Patapsco State Park - Nat. Hist. Soc. Maryland - Junior Bulletin - Vol. 3 - No. 3 - pp. 30-36 - 2 pls. with 15 hand-colored figs.

1939 - October - A collection of Amphibians and Reptiles made in Frederick County - Nat. Hist. Soc. Maryland - Junior Bulletin - Vol. 3 - No. 4 - pp. 53-55 - 8 figs.

1940 - January - The Amphibians of Cherry Hill - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 4 - No. 1 - pp. 6-9 1 pl.

1940 - January - A Sea Turtle Record for Virginia - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 4 - No. 1 - p. 27.

1940 - April - Notes on the Turtles of the City of Harrisburg and Vicinity, Dauphin County, Pennsylvania - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 4 - No. 2 - pp. 34-35 4 figs.

1940 - June - The Wood Frog in Maryland, Rana sylvatica sylvatica (Le Conte) - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 10 - No. 10 - pp. 88-96 - 1 colored plate - 22 figs.

McCauley, Robert H. Jr.

1939 - March - An Extension of the Range of Abastor erythrogrammus - Herpetological Notes - Copeia - No. 1 - pp. 54.

1939 - July - Differences in the Young of Eumeces fasciatus and Eumeces laticeps - Copeia - No. 2 - pp. 93-95.

1939 - January - Notes on the Food Habits of Certain Maryland Lizards - American Midland Naturalist - Vol. 22 - pp. 150-153.

1940 - March - A Record for Eumeces anthracinus from Georgia - No. 1 - p. 50 - Copeia.

1940 - July - Amphibians and Reptiles from Garrett County, Maryland - No. 2 - p. 120 - Copeia.

McClellan, William M., S.J.

1934 - December - Some Haunts of Lygosoma laterale in Southern Maryland - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 5 - No. 4 - pp. 19-20.

1939 - March - Some Questions on Eumeces in Maryland - Nat. Hist. Soc. Maryland - 10th Ann. Senior Bull. - Vol. 9 - No. 7 - pp. 59-62.

Morse, Max

1904 - Batrachians and Reptiles of Ohio - Proc. Ohio State Acad. Sci. - Vol. 4 - Pt. 3 - pp. 93-144 - 1 photo. - 3 figs.

Netting, M. Graham

1930 - January - The Occurrence of Lizards in Pennsylvania -

Carnegie Museum - pp. 1-4.

Norman, John E.

1939 - October - Amphibians and Reptiles Found In and Around Curtis Wright Airport, Bonnie View Golf Club, and Western Run Parkway - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 3 - No. 4 - pp. 58-63.

1940 - April - Record of Two-tailed Salamander - Nat. Hist. Soc. Maryland Junior Bull. - Vol. 4 - No. 2 - p. 48.

1940 - April - Record of *Elaphe quadrivittata* (Yellow Rat Snake) Eating Fish - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 4 - No. 2 pp. 48-49.

1940 - January - Record of Swamp Tree Frog (*Pseudacris nigrita feriarum*) Dug Out of Hibernation - Nat. Hist. Soc. Maryland - Vol.4 - No. 1 - p. 27.

Norman, William

1939 - July - Amphibians and Reptiles Noted Around the McMahon Quarry During 1939 - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 3 - No. 3 - pp. 40-42 - 1 fig.

1939 - October - Record of Wood Turtle from Eastern Shore, Maryland - Nat. Hist. Soc. Maryland - Junior Bull. - Vol. 3 - No. 4 - p. 64.

Ortenburger, Arthur I.

1928 - The Whip Snakes and Racers - Univ. Mich. Studies - Mem. Univ. Mich. Mus. - Vol. 1 - pp. 1-247 - fig. 1 - 64-36 pls.

Putens, Louis

1936 - May - The Green Tree Frog (*Hyla cinera*) - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 6 - No. 8 - p. 57.

1936 - August - Two Early Spring Frogs - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 6 - No. 12 - pp. 72-74.

Robertson, Harry Charles

1933 - May - The Queen Snake - *Natrix leberis* (Cope) - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 3 - No. 9 - pp. 33-34.

1933 - October - Fangs of Maryland Pit-Vipers - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 4 - No. 2 - pp. 7-9 - 3 figs.

1934 - August - The Common Swift - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 4 - No. 12 - pp. 72-73 - 2 figs.

1935 - January - Collecting the Copperhead - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 5 - No. 5 - pp. 24-30 - 6 figs.

1936 - July - Some Snake Myths - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 6 - No. 2 - pp. 65-68.

1936 - February - The Life History of the King Snake (*Lampropeltis getulus getulus*) - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 6 - No. 6 - pp. 32-37 - 7 figs.

1939 - June - A Preliminary Report on the Reptiles and Amphibians of Catoctin National Park, Maryland - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 9 - No. 10 - pp. 88-93 - 3 figs.

Roddy, Harry Justin

1928 - Reptiles of Lancaster County and the State of Pennsylvania - Pub. by the Author - pp. 1-53 - 23 photos. - 4 figs.

Ruthven, Alexander G.

1908 - Variations and Genetic Relationships of the Garter Snakes - U.S. Nat. Mus. Bull. 61 - pp. 1-201 - Figs. 1-82 - pl. 1.

Stejneger, Leonhard and Barbour, Thomas

1939 - Check List of North American Amphibians and Reptiles - Harvard University Press - pp. 1-207.

Stull, Olive Griffith

1940 - Variations and Relationships in the Snakes of the Genus *Pituophis* - U.S. Nat. Mus. Bull. 175 - pp. 1-225 - 84 figs. and graphs.

Surface, H. A.

1906 - September - First Report of the Economic Features of the Turtles of Pennsylvania - Zoological Bulletin - Penn. Dept. Agric. - Vol. 6 - Nos. 4 & 5 - pp. 105-195 - 15 photos. - 16 figs.

1907 - September - The Lizards of Pennsylvania - Zool. Bull. - Penn. Dept. Agric. - Vol. 5 - Nos. 4 & 5 - pp. 233-264 - 6 photos. - 2 figs.

1908 - September - Serpents of Pennsylvania - Zool. Bull. - Penn. Dept. Agric. - Vol. 4 - Nos. 4 & 5 - pp. 113-208 - 29 photos. - 25 figs.

Taylor, Edward H.

1935 - July - A Taxonomic Study of the Cosmopolitan Scincoid

Lizards of the Genus Eumeces with an Account of the Distribution and Relationships of its Species - Sci. Bull. - Univ. Kan. - Vol. 36 - No. 14 - pp. 1-643 - 114 photos. - 83 figs.

Townsend, M. T.

1926 - January, February, March - The Burrowing Habit of the American Toad - Vol. 5 - No. 1 - pp. 4-8 - Quarterly Bulletin - Maryland Academy of Sciences.

Trapido, Harold

1937 - The Snakes of New Jersey - Newark Museum - pp. 1-60 - 40 photos.

Wagner, Carroll

1934 - December - Mouth-rot, A Common Disease of Snakes - Nat. Hist. Soc. Maryland - Senior Bull. - Vol. 5 - No. 4 - pp. 20-23.

Wright, Anna Allen, & Wright, Albert Hazen

1933 - Handbook of Frogs and Toads, The Frogs and Toads of United States and Canada - Comstock Publishing Co. - 82 plates - 29 figs.

Wright, A. H. & Harold Trapido

1940 - August - *Pseudotriton montanus montanus* in West Virginia - No. 3 - p. 135 - Copeia.

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THE LIZARDS OF CENTRAL AND SOUTHERN MARYLAND

BY

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Baltimore, Maryland
March, 1943

THE LIZARDS OF CENTRAL AND SOUTHERN MARYLAND

****

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FOREWORD

In the natural history of a single State some groups, of course, will have but a few representatives. Since this is true of the reptilian suborder Sauria, officials of the Natural History Society of Maryland are of opinion that enough of data on this subject have already been collected by several of its members to furnish matter for a substantially complete account. Accordingly, the few locally resident members of the Society who are known to have given most attention to the lizards of the State have been invited to contribute their findings to this Proceeding, and most of them have done so.

Such an origin sets evident limits to the scope of the account. In point of intrinsic character, it attempts no minute taxonomical study. While aiming at the strictest accuracy in all assertions of fact, the matter here presented is rather elementary than technical.

On the score of geographical range also there is something yet to await. The data submitted include little experience with the lizards of the Eastern Shore of Maryland, and none with those of the western highlands of the State. It is possible that these omissions are more academic than practical. Published records tend to suggest that little if anything of value to our subject would accrue from a survey of the districts just mentioned, and that the species of central Maryland from Baltimore County to Point Lookout probably include all but acknowledged rarities within the State. Acquaintance with the western highlands of the Appalachian region might possibly have added to our list the scincoid species _Eumeces anthracinus_, of which a single specimen, recorded years ago from _Allegany County_, is listed by Taylor (_The Genus Eumeces_, p. 386); but, to judge from the same author's _further researches_, this species appears to be a highland type and of limited distribution. As regards the Eastern Shore, we know of no positive evidence that it harbors any species of lizard not to be found west of the Chesapeake. Nevertheless, so long as these regions must be omitted, the present account of Maryland lizards can lay no claim to the value of a complete check-list. Nor have we definite records from every county presumably inhabited by each of the five species here enumerated, even within the general region selected for review. As a matter of fact, St. Mary's is the only County in which we have actually found them all. We have merely covered some typical districts of the Coastal Plain and of the eastern Piedmont Plateau, to an extent sufficient for a practical view of this branch of reptile life as represented in Maryland.

Probably no fresh discovery will be found in these pages. They merely assemble hitherto unpublished matter gathered within the Society. In keeping with this domestic character, there has been little borrowing from publications of greater scope and authority. Some general orientation, and the filling in of a few details of description, are taken from such standard sources as Stejneger and Barbour (the fourth edition), Ditmars, and Taylor, whose indispensable guidance is gratefully acknowledged. For readers who may desire sources either fuller or more specialized, a selected bibliography is appended. All of the more precise data here recorded are drawn from our personal experience, except where other sources are expressly acknowledged.

In addition to the Table of Contents an analytical index has been deemed unnecessary and omitted for economy of space.

The writer's only title to assemble and present this material rests on priority of time in the field. But while his experience extends over twenty-five years, his knowledge of technique, and even acquaintance with the presence in Maryland of one important species (*Eumeces laticeps*), has come so late as to reduce much of his earlier notes to mere approximations. Where this defect is known to exist, inference will not be offered as fact. His collaborators, Messrs. Romeo Mansueti and Francis Groves, both of Baltimore, have done more valuable work in a much briefer period. Of the quality of their records, and of the pleasure of every association with the authors, it would be difficult to speak too highly. The Bibliography is largely Mansueti's contribution in addition to his original data. Most of the ensuing text records our experience in common, though a few particulars are ascribed to their observers by name.

The illustrations require a word of acknowledgment and explanation. Plates 1, 2, 3, 4 and 6 were private records never originally intended for publication. The use of them here is kindly permitted by the Rev. A. S. Thoman, S. J., who took them, in the early summer of 1935, from specimens etherized enough to be tractable, but still living. To exhibit their dimensions, he arranged them on paper ruled by hand in half-inch squares. The ruling was fairly accurate, but not mechanically so. In estimating dimensions in these views, here enlarged by the Rev. J. A. S. Brosnan, S. J., I have reckoned from the sizes of carefully calculated averages of from five to ten squares in overlapping series, so as to correct possible differences between any two adjacent ones. It has thus been possible to arrive at a percentage of the natural size, which had to differ in the plates according to their capacity for enlargement. The dorsal view of *Leiolopisma unicolor* corresponding to Plate 4 was at hand, but not serviceable for enlargement. As to Plates 5,7, 8 and 9, they were taken directly by the Rev. J.A.S. Brosnan (all but Plate 5, from alcoholic specimens), with the perfect definition characteristic of all his photography. Since Plates 7 and 8 could not be taken at the natural size for use on any ordinary page, the millimeter rule was inserted between the reduced figures. The muzzles of the specimens could not be arranged on the same plane with the rule and also exactly opposite its end, but the proper allowance can be approximately made, noting at the same time that the heads are slightly depressed in the attitude assumed after death.

The writer is deeply indebted to the guidance of Professor Robert H. McCauley, Jr., of Goddard College, Vermont---a native of Maryland and an authority on its herpetology---to whose writings and private communications some reference will be made.

As these lines are written, many a lifelong occupation hangs in unstable balance, and pursuits which once seemed settled are giving place to others imposed by stern necessity in the common cause of national defence. Some of our Society's particular activities will doubtless be interrupted for a time, and, for one reason or another, may never be resumed by the same hands that now relinquish them. Perhaps this little hoard of private records may better be collected now than run the risk of never emerging from its fragmentary state. We hope that such an incentive may somewhat avail to excuse its many defects.

Woodstock College, Woodstock, Maryland. William H. McClellan, S.J.

MAY 28 '43

BIBLIOGRAPHY

BRADY, MAURICE K. 1937. Natural History of Plummer's Island, Maryland. VI, Reptiles and Amphibians. *Proc. Biol. Soc. Wash.*, Vol. 50, pp. 130-140.

BURT, CHARLES E. 1931. A Study of the Teiid Lizards of the Genus *Cnemidophorus*, with special reference to their Phylogenetic Relationships. *U.S. Nat. Mus. Bull.* 154, pp. 1-286.

1937. The Lizards of the Southeastern United States. *Trans. Kans. Acad. Sci.*, 40, pp. 349-366.

FOWLER, HENRY W. 1915. Some Amphibians and Reptiles of Cecil County, Maryland. *Copeia*, 1915, No. 22, Sept. 22, pp. 37-40.

1925. Records of Amphibians and Reptiles for Delaware, Maryland and Virginia. II, Maryland. *Copeia*, 1925, No. 145, Aug. 20, pp. 61-64.

McCAULEY, ROBERT H., JR. 1939. Differences in the Young of *Eumeces fasciatus* and *Eumeces laticeps*. Copeia, 1939, No. 2, July 12, pp. 93-95.

1939. Notes on the Food Habits of certain Maryland Lizards. *Amer. Midland Naturalist*, xxii, 1, July, 1939, pp.150-153.

1940. A Distributional Study of the Reptiles of Maryland and the District of Columbia. *Cornell U. Abstracts of Theses*, 1940, pp. 267-269.

McCAULEY, R.H., JR., AND EAST, CHARLES S. 1940. Amphibians and Reptiles from Garrett County, Maryland. *Copeia*, 1940, No. 2, July 28, pp. 120-123.

NOBLE, G. K., AND MASON, E. R. 1933. Experiments on the Brooding Habits of the Lizards *Eumeces* and *Ophisaurus*. *Amer. Mus.* Novitates, 619,1-29.

STEJNEGER, LEONHARD, and BARBOUR, THOMAS. 1939. A Check List of North American Amphibians and Reptiles, 4th edition. Harvard Univ. Press, xvi, 207.

TAYLOR, EDWARD H. 1932. *Eumeces laticeps*, a neglected species of Skink. *Kans. Univ. Sci. Bull.*, 20, pp. 263-272.

1935. A taxonomic Study of the Cosmopolitan Scincoid Lizards of the Genus *Eumeces*. *Kans. Univ. Sci. Bull.* 23, 1-643.

(A few particular notes on Maryland Lizards have also appeared occasionally in the *Bulletin* and *Junior Bulletin* of the Natural History Society of Maryland. See especially Mansueti's list of Amphibians and Reptiles occurring within twenty miles of Baltimore, pp. 25-27; Proceedings of the Society, No. 7, December, 1941.)

INTRODUCTION

Relation of the Lizards to General Zoology.---Among the Vertebrates the class *Reptilia*, next after their seclusion from the Mammals, are chiefly distinguished by a covering of either scales or plates, which are not detachable from the skin, like the "true scales" of most fishes, but thickened or hardened folds of the skin itself, known as "false scales" by contrast. The Reptiles fall into two subclasses. The *Synapsida*, reducible to the single order *Testudinata*, embrace the tortoises, terrapins and other turtles. The larger subclass *Diapsida* falls into two orders. Of these the *Loricata*, having heavily plated hides, are the crocodiles and alligators. The much more numerous members of the other order, *Squamata*, have a skin developed in typical scales, variously shaped and often partly overlapping. These comprise two highly distinct suborders, the *Sauria*, or lizards, and the *Serpentes*, or snakes.

Conspicuous differences characterize these two suborders. Even the so-called "glass snake" is easily recognized as a limbless lizard. Serpents have no eyelids, and their highly organized inner and middle ear has no external opening. Lizards, on the contrary, have both eyelids and outer ears, though the latter are cavities without any appendage. The serpent swallows its food whole, while that of the lizard is masticated. The serpent drinks by sucking in successive draughts, whereas those lizards which take water at all in appreciable quantities do so by lapping with the tongue. This organ is relatively broad, and its tip, when cleft, is not deeply so, like the narrow and delicately forked tongue of the serpent. The lizard's tongue is thus adapted to aid in mastication, and is also used by some species to touch external objects in feeling or tasting, somewhat in the typical serpent fashion.

Despite the common human repugnance to "creeping things," we are justly less apprehensive of lizards than of serpents. The former present no real menace, since the only venomous lizard in the United States is the Gila Monster of the southwestern deserts. The lizard's evident shyness and rapid flight serve to assure us of aloofness, while, on closer inspection, the creature's general aspect is not forbidding, and its active pose and bright, watchful eye suggest alertness and even a touch of sagacity. When still better known, the lizards prove to be no neutrals, but active allies, since their food (within our territory) consists entirely of insects, including termites and other species of ants. On all accounts this type of reptile life is worthy of our better acquaintance.

Position of Maryland Species among the Lizards.---Taken the world around, the lizards, even more than the serpents, exhibit distinct types, some of which comprise whole families of many genera and species. Maryland's quota of representatives is limited, but interesting. The family *Iguanidae* gives us one of its smallest members in the Northern "Swift" or "Fence Lizard," *Sceloporus undulatus* (var. *fasciatus*, Green), the most familiar and widely distributed lizard in the State. The family *Teiidae* itself consists of a single genus, of which we possess one species, the slender and rapid "Race Runner," *Cnemidophorus sexlineatus*. Finally, the great family *Scincidae* is represented by the "Ground Skink," *Leiolopisma unicolor*, and by two members of the genus *Eumeces*, the "Common Skink," *Eumeces fasciatus*, and the larger

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"Broad-Headed Skink," *Eumeces laticeps*. These five species will be treated in the above sequence.

THE NORTHERN SWIFT, OR FENCE LIZARD

Family: *Iguanidae*,
Genus: *Sceloporus* Wiegmann,
Species: *Sceloporus undulatus fasciatus* Green.

Taxonomy.---The designation *Sceloporus undulatus undulatus*, employed in Stejneger and Barbour's fourth edition (1939, p. 70), is now reserved by Green to the type variety or subspecies, whose general range is south of Virginia, while its counterpart from thence northward is named by him *Sceloporus undulatus fasciatus*. The latter, so far as is yet known, is "*the swift*" for purposes of identification in Maryland, where the distinction "northern" has probably no significance. That the two types are distinct enough to constitute varieties of a species (*undulatus*) appears to be fairly established, as well as the fact that *they are* not isolated species. I have witnessed one instance of sexual rivalry between a Baltimore County swift and a specimen from Alabama.

Chief Characters.---A short and well proportioned head, not *notably flat or broad*, clearly distinct at the neck, with snout somewhat pointed and much depressed. Though the eye is not large, its socket is emphasized by heavy shields above. The body is most distinguished by robustness of form and a rough and bristly aspect due to strongly keeled and sharply pointed scales. The tail is rather slender in comparison. In perfect adult specimens it is slightly longer than the head and body. The limbs are relatively long and stout, and the digits armed with slender recurved and pointed claws adapted to climbing any but very smooth surfaces.

Size.---The limit of length of this species in Maryland is about *6-1/2 inches* (166 millimeters) entire. The female is considerably more robust than the male of equal age, and her tail claims a slightly less proportion of the total length, the ratio in the male averaging 58 to 60 per cent of the whole, but in the female 55 to 56 per cent. A large adult male from Anne Arundel County measured, from snout to vent, 69.5 mm.; tail, 96.5 mm.; a large adult female from Charles County, snout to vent, 76.5 mm.; tail, 92 mm. The average example is slightly smaller than these.

In the accompanying Plates 1 and 2 the figures appear at 57 per cent of their natural size. Neither is of normal length, both having "regenerate" tails, which never attain the full original length. The portions due to second growth are especially conspicuous in Figure 2. In other respects the figures are good examples of an adult male (left) and a female (right) probably two years younger, but mature.

Color.---Between adults of opposite sex there is noticeable difference in detail. The female bears two series of dark brown transverse bands on a ground-color of pale to medium gray or brown. Each series occupies the dorsolateral half; each band is inclined forward, the rear of its angle enclosing a short margin of dull white.

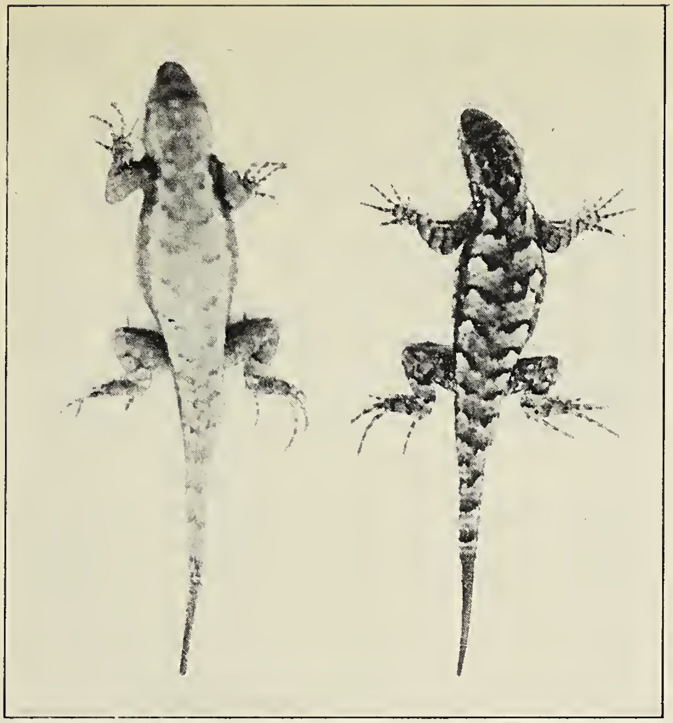

PLATE 1

Dorsal Aspect

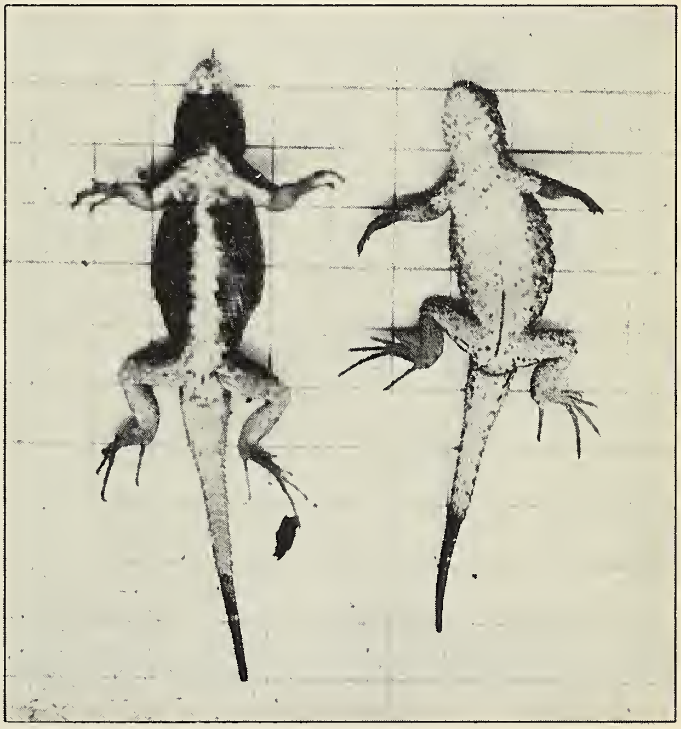

PLATE 2

Ventral Aspect

THE NORTHERN SWIFT (Sceloporus undulatus fasciatus)

Left, Adult Male Right, Adult Female

57 per cent of natural size

The limbs are banded with a lighter reddish brown. In the adult male this banded pattern is almost obscured, the dorsal view presenting at some distance an aspect of uniform dull bronze or chocolate. The male is still more clearly distinguished by deep-toned patches of copper blue or green on the throat and lower sides, encroaching on the ventral surface and partly bordered with black. The under surface in either sex is grayish white with small irregular dots of a darker hue, and, in the female, a straight and narrow median line of brown, sometimes interrupted, extending from the vent to a short distance forward.

The young of both sexes have the banded pattern of the adult female. The areas of blue distinctive of the male are not present in newly hatched specimens. Groves finds them pale but distinct, somewhat darker on the throat than on the abdomen, in a young male measuring 110 mm. entire, and probably nearing the end of its third year.

Three newly hatched specimens measured by Groves averaged a total length of 52.8 mm. (2-1/16 inches). The relative length of their tails varied somewhat, the average being 55 per cent of the total length.

The color of a specimen of any age may vary briefly with considerable changes of temperature. When taken from winter quarters or from shelter in rainy weather, and consequently chilled and sluggish, the swift may appear almost black, but soon resumes its normal hues with increasing warmth. In addition to this, the swift seems to enjoy a slight margin of more stable adaptation in color to habitual surroundings. This is especially true of the evenly colored coat of the male. The approach to an old trestle, strown with large blocks of waste granite darkened by railroad soot, harbored a colony of which the males that sported over the rocks were deep gray in color, hardly resembling their bronze-coated companions among the fallen leaves in the nearby woods. As the railroad had been abandoned some years earlier, these lead-colored examples cannot have been directly affected by the soot.

Distribution.---The swift occurs all over Maryland. We have records from the following localities:

Anne Arundel County: Furnace Branch, near Glen Burnie; Camp Linstead, near Severna Park; Fort Smallwood; Crownsville; Shore Acres, near Arnold, on the Magothy River; Indian Landing.

Baltimore County: Potter's Field and Herring Run Park, Cherry Hill, Baltimore; Fort Armistead, Baltimore; Upper Patapsco State Park, near Orange Grove; Gwynn Oak Park; Arbutus; Vineyard; Gunpowder Falls; Davis, Granite, Stony Ridge and other points within a three-mile radius of Woodstock College.

Calvert County: Cove Point.

Carroll County: Pataspco River, east of Marriottsville.

Charles County: Benedict; Chapel Point.

Frederick County: Sugar Loaf Mountains; Catoctin Recreational

Reserves; Gambrill State Park.

Howard County: Lower Patapsco State Park.

Prince George County: Ammendale; Priest's Bridge; Patuxent River near Laurel.

St. Mary's County: Camp Calvert, Leonardtown; Ridge; St. Inigoes; Beachville.

(On the Eastern Shore: Gary's Branch, Caroline County, and Willards, Worcester County.)

Environment.---The swift revels in dry warmth, and is usually seen exposed to the sun, yet has its limits of endurance. Mansueti has found it in the open at a temperature of 98° Fahr., but unable to survive prolonged enclosure in an overheated container. It probably shifts its position frequently under temperatures above 90°. It never rests on a rocky surface whose accumulated heat would be unbearable to human touch, though it may skim over such surfaces in the urgency of flight. On the other hand, it constantly shuns moisture, except in the degree required to incubate its eggs. I have never seen a specimen accept the smallest drop of water, even when applied to the lips.

The swift's love of dry and sunny exposures keeps it in or near to clearings. In heavy timber it is seldom far from an opening, and usually on the margin of a field. Logs and stumps afford favorite perches for both exposure and lookout. The lizard is a sure and rapid climber, though more terrestrial than arboreal on the whole. Stone walls and unpainted fences are among its most welcome haunts, and afford a background against which the gray or bronze coat often passes unnoticed. When ascending a tree to escape pursuit, the swift seldom climbs very high, and soon returns to lower levels. Let a few acres of woodland or brush be cleared in any region not too near a settlement, and a second season will usually find it fairly populous with swifts if it is left unplanted.

General Conduct and Disposition.---This commonest of all our lizards is both timid and alert. In flight it darts forward with body and tail straight as an arrow, relying wholly on its powerful limbs. It can, however, be cautiously approached near enough to be seized with the hand, or at least to be snared with a running noose of fine twine attached to a pole of moderate length. Keeping constant watch on the human intruder, it never suspects the noose, often tossing it aside by a quick motion of the head as if in mere annoyance, without changing its position. When handled, this lizard seldom attempts to bite unless in momentary pain.

In captivity the swift loses much of its dread of human presence. I have seen a pair of adults so completely tamed within one season that either could be lifted at pleasure, from its cage or anywhere in the owner's room, without a sign of fear. Even the average half-wild specimen, when at liberty indoors, will hang for hours on a wire window-screen, pursuing and neatly catching flies and other insects that may settle near at hand.

Besides its speed in running, and the ability also to leap a few

inches from point to point, the male swift has a peculiar vertical movement of the forepart of the body, using the hind legs as a fulcrum from which the head and thorax are quickly raised and lowered repeatedly by flexion of the forelegs. This grotesque bobbing is often witnessed in the lizard's native environment, especially in the vicinity of other swifts, and seems to be a sort of challenge. In captive specimens, even solitary, it can be excited by certain qualities of sound, such as the lower notes of a flute or the hum of a distant lawnmower. When one male detects the presence of another, a bobbing exhibition usually precedes the inevitable fight, in which each combatant's point of attack is not his opponent's head, but the genital region. Even in the absence of a female the males are very pugnacious, at least in spring and early summer, and only one outclassed in size by its opponent is likely to take to flight without a trial of supremacy.

The use of the long limbs to elevate the body may be resorted to in situations where flight would be desirable but is impossible. An adult female swift was much afraid of a male specimen of the broad-headed skink, confined for a time in the same cage with her. Whenever he approached unpleasantly close, she rose on her feet to the full height of her limbs, making of her body a bridge nearly an inch above the surface of the floor.

Observation of many captive specimens makes it appear probable that in the wild state they spend the night at a slight distance above ground instead of under some terrestrial shelter. My own captives invariably sleep either on an inclined branch of wood or some inches up the wire screening. Here they may hang upright, horizontally, or head downwards for the whole of their night's rest, the position of the uppermost limbs always suggesting that most of the weight hangs from them, and that sleep tends to contract the muscles controlling the hooked claws and give them firmer hold. This habit of sleeping aloft is quite constant, even when bark or other acceptable shelter is provided on the flooring.

Food.---In the natural state the swift's food seems to consist entirely of insects, though Mansueti has found that one captive specimen would take meat if placed in the mouth. Among its articles of diet we have found house flies, horse flies, May flies, small moths, crickets, various beetles, many kinds of larvae, roaches, ants of various kinds, and even (in captivity) earthworms.

The lizard sees small objects clearly at a distance of a few feet, and quickly notices anything in motion. At close quarters even the movement of an antenna may attract its attention. It captures its prey by a sudden dash, seizing it between the jaws, where it is first crushed and then well chewed. The tongue seems to aid but little in mastering a large mouthful, which is tossed gradually farther to the rear while being chewed. If the morsel is both long and bulky, such as a larva just capable of being grasped by one end, it is often flung into pieces by violent shaking, and the separate fragments retrieved afterwards. In captivity, once a certain kind of food has become familiar, dead and motionless examples may be investigated and taken as well as moving ones.

Between captive mates after the occurrence of breeding I have

several times observed a curious check upon rivalry for food. If a morsel was dropped at a fairly equal distance between the two mates, and the female approached it, the male would lie motionless and close his eyes while she took and ate it. It was hard to judge whether he was deterred by his partner's greater bulk, or by some instinct through which nature had provided for the nourishment of the gravid female. Since this trait of conduct is not common to lizards in general, one would incline to the first explanation, were it not that the male does not take to flight at the female's approach, or otherwise show fear of her, but simply yields her the right of way.

Digestion is active, though we cannot say just how rapid. However much or often a lizard might eat, I have never known refuse to be voided oftener than once a day, usually early in the morning. Of the softer foods, like flies and larvae, a greater quantity can, of course, be eaten in a day than of the harder beetle and cricket diet, much of which must be eliminated.

Reproduction.---Very much might be written on questions of interest related to this subject. Most data are obtained from captive specimens, but a few points may be observed in the natural state.

In marked contrast to the common ways of reptiles is the duration of the partnership between the male and female swift. A pair may be seen hunting close together so early in the season that, considering the rivalry for food and breeding which any one may observe in a thickly colonized area, the union of the two must have been determined very soon after hibernation. I have taken two such pairs as early as April 3d. One of these pairs, moreover, was not observed (by another keeper) to breed at all in captivity, though the female laid her eggs in due time. The other pair were sent away, and their subsequent conduct never reported. As to the duration of these early unions, I have taken a male and female from the same small pine trunk on May 12th, when the female was gravid; and have also seen a male and a female at opposite ends of the same fence-rail as late as May 29th, the female's proportions then betraying no presence of eggs, though another female observed on the same day was still gravid. It would not be safe to infer that union between two swifts persists from year to year, but for at least a single season it seems to endure longer than that of other lizards, and far longer than that of most serpents.

Sight appears to be the male's chief aid in discovering a prospective mate. Once, at any rate, a captive male's vigorous efforts to reach a female through a wire screen were completely ended by covering the wire with cardboard. Invisibility seemed to set the female as far from his consciousness as any distance could have done.

The constancy of mates is interrupted by captivity, where the lizard begins life again in altered circumstances. A male thus thrown into the society of a strange female at any fairly early date will usually breed with her, though meeting with no encouragement. In several cases of captive breeding the mates have come from places a mile or more apart. Captivity records of the period of gestation are thus reduced in value by the presumption that the female has probably had an earlier mate.

In captive breeding the female is never compliant at first, and

may succeed in quite repelling the male's advances. As a typical case among several, a male taken on April 3d received a mate from another locality on April 7th, and tried to breed at sight, but was repulsed at first. The female avoided his advances by moving about in short, jerky hops, with her back arched, but never tried to bite the male. The next day, April 8th, several more attempts were unsuccessful. Similar efforts on April 16th and 17th were equally futile. The male at last accomplished his purpose on April 18th, at 9 a. m. and 2 p. m. The process was repeated on April 22d at 9.45 a. m. and 2.30 p.m., and finally on April 23d at 8.45 a.m. and 3 p.m. The first of these six occasions, on April 18th, could have been as been as much as two weeks later than a natural breeding in the female's state of freedom, before her capture on the 7th. Hence it cannot furnish a certain terminus a quo for the whole period of gestation (of which more below). Nor is it possible to say whether breeding is repeated several times in the natural state as in this instance of captivity.

The attitude of both lizards towards this second union, if such it was, proved interesting. On April 19th two strange males were introduced into the cage. One of them was instantly engaged in combat by the male already in possession. The female took no notice of either, until the unoccupied stranger approached her directly, when she drove him away with a vigorous bite, a measure she had never adopted towards her captive mate. The two intruders were then removed. On the other hand, the male of this captive pair completely ignored a second female introduced on April 25th. The captive union, once established, was kept inviolate by both parties.

Gestation and Incubation.---"Incubation" as applied to the eggs of any lizard in Maryland merely means the period of development from deposit to hatching, since even those females which remain with their deposited eggs (as those of Eumeces fasciatus) are not known to "incubate" them in the sense of contributing directly to development. By "gestation" here is meant the period between the fecundation of the eggs and their deposit.

All reptiles' eggs require at least a temperate warmth, and even more a constant state of moderate moisture without actual immersion in water. On the latter account they are never left exposed, but always buried in some humid medium. The eggs must actually increase in volume between deposit and hatching. This they do by absorbing external moisture through the flexible and porous shell and assimilating it to the contents as the body of the embryo draws upon the albumen for its growth.

While it is easy to bring the eggs to hatching by artificial means, it is far from easy to supply the exact balance of conditions which the mother's instinct can secure in her native habitat. Captive incubation usually somewhat retards development, and this must always be borne in mind in forming conclusions. My only complete record is that of the captive female already several times referred to. Her eggs were deposited on June 12th, exactly 7 weeks after her last breeding on April 23d. Since the successive breedings in captivity may have delayed deposit, the date of the latter, June 12th, needs comparison with those of other females bred before capture. For such we have the dates May 27th, May 31st, June 2d, and two on June 6th.

Allowing again for some delay of gestation in captivity, this would seem to place the average time of deposit at about the end of May.

As to the period of incubation, the eggs just mentioned as laid on June 12th were hatched on September 7th to 12th, a period of 92 days for the last to hatch. Of females breeding at large, but laying in captivity, the only case followed up was that of a clutch deposited on May 31st, which hatched on September 3d and 4th, after 96 days. That in these two cases some retarding must be allowed for, is clear from another instance of a kind rarely observed. A single clutch of swift's eggs were discovered by Groves in their natural medium on July 2d, three of which artificially incubated, hatched on August 3d, a full month earlier than the clutches just mentioned. These eggs came from Anne Arundel County, where the season would be about two weeks in advance of conditions in Baltimore County, so that the eggs may have been deposited as early as May 15th, giving them a long start in normal development before their discovery. Comparing this instance with the known dates of captive deposit mentioned just above, and making due allowance for time at both ends of the period, it seems safe to put the average period of gestation for the swift at about eight weeks, and that of incubation at about ten. But precise data are unattainable, especially since the eggs of the swift are so rarely discovered where the mother has hidden them without leaving a trace of their presence.

Eggs, their Medium and Growth.---The eggs, as usual among reptiles, have a flexible white integument like parchment, so fine in texture at deposit as to reflect a creamy tint from the contents, but soon becoming thicker and less translucent. All Maryland lizards lay an egg of elliptical shape, which during its subsequent growth does not tend so strongly towards a spherical outline as those of many serpents, but preserves the original proportions fairly constant. Both size and rate of growth are exhibited (for the end of the period) in a case recorded by Groves---that of the clutch discovered in situ on July 2d. Two of the 8 eggs having been damaged in excavation, the remaining 6 averaged 15.5 x 11.6 mm. at this date, probably at least 6 weeks after deposit. Two of these being used later for examination, the remaining 4 were again measured on July 17th, showing an average of 16 x 11.9 mm. One having been accidentally ruptured on August 2d, the remaining 3 hatched normally (as noted above) on August 3d, three weeks after their last measurement, which therefore nearly represents the limit of their growth.

Other instances must supply us with the first term of the comparison. Of eggs deposited in captivity, one clutch of 11 averaged 12.57 x 7.03 mm. Another clutch of 12 averaged 11.76 x 7.09 mm. These eggs were laid at the typical dates of June 1st and 9th respectively, and appeared quite normal, so that their dimensions may be taken as representative. When compared with Groves' last average above---of 16 x 11.9 mm. for another clutch shortly before hatching---it will be seen that the original volume of the swift's eggs is much increased during incubation.

The number of eggs in a normal clutch may vary considerably, especially with the mother's age and size. Groves records 7 eggs, and Mansueti 8, dissected from females dying in captivity, both near the end of June. One of my females, after breeding in freedom laid 14

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eggs in captivity; one of Groves', 15. These are normal numbers, not possibly increased by a second breeding in captivity. Among captive-bred females I have known one case of 16 eggs, one of 17, and several of 12 to 15. This last figure is about the natural limit.

As might be expected in a species fond of open country, the swift prefers to bury her eggs in sand, just deep enough to unite the constant moisture of subsoil with indirect warmth conducted from a sunlit surface. The clutch found by Groves (at Cedar Point, near Camp Linstead, Anne Arundel County) may be regarded as typical. The eggs were in the sandy soil of a terrace about 5 feet high, flanking the shore of the Severn River they lay 3 inches beneath the upper surface, and 6 inches back from the face of the cut---a position which, as Groves observes, "afforded good drainage facilities and kept the eggs from becoming sodden during rains." Too much wetting can harden and destroy reptiles' eggs; the required moisture must be constant, but faint.

The instincts governing deposit are reflected under captive conditions. A female taken in Charles County was caged at Woodstock, in a window with southern exposure, the floor of the cage being provided with damp sawdust an inch and a half deep. There were in her compartment also two heavy shelters of bark, one lying on the sawdust, the other (on the sunny side of the cage) covering an oblong box of moist sifted sand. She ate and behaved quite normally from May 16th to June 5th, after which she was continually restless and striving hard to escape through the wires. On several successive days she selected one corner, the most exposed to the afternoon sun, and scratched away all the sawdust to the depth of the wooden floor, repeating the process next day after all had been restored, but not using the cavity. Suspecting that it was too dry, I moistened the sawdust more thoroughly on June 9th. At 4 that afternoon she had once more made her excavation and was lying in it, and beginning to deposit her eggs. The process took about an hour. I could not observe the lizard between 5.15 and 6, but at the latter hour I found the sawdust leveled over the excavated corner, and the lizard just completing the operation, drawing sawdust towards her body with her forefeet and passing it to the rear with her hind legs. She had eaten one mealworm at the beginning, but would not eat afterwards, going up at once to her usual sleeping-quarters. Removing the sawdust with care I found the eggs, a clutch of 12, and removed them to an incubator. Strange to say, the lizard had ignored the box of sand, covered with bark, for a spot in the sawdust which had no covering from above.

A more significant account of the conduct of a captive female is kindly supplied by John Norman. He writes: "About 4 p.m., when the sun had left the cage, she put her head down on the sand next to the water pan, which was 3 inches in diameter. She then worked her head into the sand and under the water pan. Then, with great effort, she lifted one side of the pan and spilled the water on the sand. Out of curiosity I filled the pan again and placed it in the exact spot it had occupied before. Immediately the lizard, following the same procedure as before, upset this pan of water, and then thrust her nose into the damp sand. I then put a third pan of water into the cage, and this also was upset in the same manner and at the same

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spot. When a fourth pan of water was put in, the lizard paid no attention to it, but tested the sand with her nose as before. She then began to dig into the damp sand beneath the pan. In five minutes she had burrowed under the whole width of the pan. With her head and tail protruding on opposite sides, she laid 13 eggs at 2 inches below the surface of the sand. The cavity was dug close to the glass front of the cage, where I could see into it perfectly. The lizard's body was bent at an angle of almost 90 degrees, the apex being in the area of the vent. The first 5 eggs were laid on an average of 5 minutes apart, and the last 5 on an average of 13 minutes apart. The lizard then filled up the cavity with both her fore and hind feet, the movement always being backward. As each egg was laid there was a lateral movement of the body, with apparently a good deal of straining. After adding the last bit of covering to the eggs, she emerged, apparently quite weak, but ate some mealworms within 5 minutes."

This specimen, captive in Baltimore at the time, deposited her eggs as thus described at the exceptionally late date of July 1st. She had probably retained them as long as possible while unable to find sand moist enough for her purpose. Her method of finally supplying the lack of moisture reveals a degree of sagacity hardly to have been expected in any reptile. Norman has since informed me that another captive female deposited her eggs on June 1st, at a depth of 2-1/2 inches in sand which he had kept moist for the purpose, but beneath the water vessel. The date in this case was about the natural one.

Hatching.---It may suffice to mention here the "egg-tooth" as common to all the lizards of Maryland, as it is to reptiles generally. When the time has come for the young lizard to emerge, it needs a means of cutting the flexible integument, which cannot be cracked or shattered by a blow upon one point from within. The organ developed for this purpose during the embryonic stage is a special tusk projecting forward only a minute distance from beneath the upper lip, but highly enameled and provided with a horizontal cutting edge at its extremity. A short sweep of the snout over the integument's inner surface engages the egg-tooth in its tissue and slits the latter as cleanly as a razor. After this is done, and the head thrust through the opening, the lizard, though lying quiet and in no apparent discomfort, may not emerge for hours, or even until the next day, usually because the umbilical cord is still attached to remains of food-yolk within. When the latter is all absorbed, or at least the detachment is complete, the young lizard emerges promptly and easily, unless deterred by fear of something seen outside, in which case it may withdraw entirely into the shell to await a safer time. Once out of the egg, it is out to stay, and self-supporting, though it may not take food for the first few days. Meanwhile the egg-tooth has fallen out within a day or two---a highly specialized organ, but one whose purpose has now been fulfilled.

As regards the care of eggs in artificial incubation, reference will be made to their capacity for recovery from areas of collapse in the integument. A word should perhaps be added about rupture. When somewhat advanced and consequently snugly filled, the shells of reptiles' eggs are easily punctured by a splinter of sawdust, or some even smaller object, encountered in moving them about. A drop of

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albumen immediately oozes out. If the egg is then laid with this drop uppermost, to reduce leakage, the albumen will usually congeal in a few hours, and the egg may develop in due course together with its fellows. When hatching arrives, one sometimes sees the head of the young lizard emerge chin uppermost, owing, of course, to some accidental inversion of the position of the egg during its last stages. Such an accident does not prove any serious inconvenience.

Thus the young have never known their mother, nor are they positively inclined to one another's society, though, if satisfied with their environment, they may not disperse far for a considerable time. Mansueti found eight very young swifts, apparently of equal age, on one tree on October 6th, which must have been at least a month after their hatching. A good center of food-supply would not be soon abandoned, especially if it also offered plenty of shelter. The factors which limit distribution in the far-ranging adult swift would be still more decisive for the less active and venturesome young. But no gregarious instinct nor family relationship would tend to keep them together even for a single day. Each of them is "on his own."

Growth and Sloughing.---We can offer no details of the rate of growth from the egg to full maturity in the case of the swift. It can hardly be sexually mature before its fourth spring (when three and a half years of age), and possibly not until a year later, when, judging from a comparison of estimates, the total length would be from 4-1/2 to 5 inches. However, these figures are merely inferential.

The epidermis of reptiles is frequently renewed to meet the demands of growth, but the old cuticle is not removed by constant minute abrasions, as in warm-blooded animals. In some lizards (as commonly in serpents) it is rubbed or stripped off either whole or in large patches. In the case of the skinks, below, we shall be able to rely somewhat on records of the observed frequency of sloughing. In the swift's case, however, I have never witnessed the process itself nor found a trace of the cast slough. To its removal almost or quite entire the pointed scales can hardly be an obstacle, since the far more prominent spikes of the horned lizard of the Southwest do not interfere with its casting an entire slough. Possibly the swift may do so only once in a season, and this directly on emerging from hibernation, when no human witness is at hand. But on this point we await further knowledge.

Enemies.---To mention the enemies of the swift is to name those of lizards in common. Hawks and shrikes are notorious destroyers. I have known a house-cat to sharpen her kittens' hunting instinct by bringing them disabled lizardsto play with, if not to devour. But the lizard's greatest and most constant peril is from several species of snakes. The Racer (*Coluber constrictor*), the Mountain Black (*Elaphe obsoleta*) and Corn Snakes (*E. guttata*), and, above all, the King Snakes and Milk Snakes (various species of *Lampropeltis*) are inveterate consumers of lizards, the last named group especially seeming to prefer them to any other food except snakes. All of these serpents easily pursue their prey by climbing, as well as on the ground.

Tail fracture and Regeneration.---For the lizard's protection in a "stern chase" nature has added to its speed in flight the advantage

of a fragile tail, which is a purely muscular appendage with no vertebral framework. Seized in the pursuer's jaws, the tail is easily detached by a slight twist, and the exposed nerves of the fragment stimulate the muscular tissue into vibration so vigorous as to engage the snake's attention and induce it to swallow the struggling morsel while the former owner escapes. The amateur human collector is often left with such a memento in his hand, until he learns to aim his grasp at the lizard's head, and, after capture, to avoid all pressure upon the tail. Lizards with imperfect tails are often seen. Even at the time of the loss, they do not seem to suffer from it.

Fracture is followed by a second growth, which is technically termed "regeneration." The new part never seems to equal the original in length. In the case of the swift, moreover, the original scalation and coloring are never assumed by the regenerate portion, though in the skinks the original coloring revives, at least in early life. The difference between the original and the regenerate parts of a tail may be easily detected in Plate 2 above, where both of the specimens shown have regenerate tails, and are therefore shorter than perfect examples of their kind. The new growth begins with the covering of the open surface of fracture by a button-like appendage of dark gray without evident scalation. Growth proceeds from this new foundation, but several years may be required before a considerable length is added, especially if a large proportion of the original tail was lost. Subsequent fractures and successive regenerations may also occur as well as a first. It requires long experience to estimate the loss which fracture may have inflicted on the original length, and then the estimate is only approximate. Hence the method common among herpetologists, of measuring lizards from the snout to the vent, so that comparison may not suffer from this unknown quantity.

Hibernation.---Exact dates for the beginning and end of the swift's hibernation period are, of course, impossible. In all reptiles the time of hibernation and that of emergence varies with the temperatures of different years. With their uncanny prescience of coming changes, they provide themselves with sufficient shelter against a freezing temperature before it arrives. In the case of the swift this shelter may be beneath or between rocks, or a burrow in the earth, or a bed of wood pulp within some decaying log or stump---the last not so likely unless fairly dry.

Mansueti has collected the swift on November 4th, the latest date known to me. As regards emergence, Mansueti mentions a specimen collected by Mr. August Selckman in Anne Arundel County on March 31st; and I have taken or seen the swift abroad in Baltimore County on April 1st, 2d and 3d in different years. The younger the specimen (so it would appear), the later it remains exposed in autumn, and the earlier it emerges in spring. Probably this is due to the fact that the smallest examples can find the greatest number of serviceable shelters. I have noticed the same thing in the case of some snakes.

General Remarks.---In spite of its preference for the heat of the sun, the swift is probably the hardiest species of lizard in the State, a venturesome traveller, and adapted to a variety of conditions, a combination of qualities which explains its wide range of distribution. In St. Mary's County, on April 22d, I took an adult

female from the ground in a stand of heavy timber, on a cloudy and windy day almost uncomfortably cool; she was sluggish and easily caught, but not cold enough to have her colors much obscured. In that locality she had probably emerged from hibernation nearly a month earlier, and the unfavorable weather did not drive her back to cover, though probably no other species of lizard would have remained exposed to such conditions. Three specimens of the common skink captured on the same occasion were all found in hiding.

Sceloporus is the most readily tamed of all our local lizards, and its habits include some highly interesting traits. It may be doubted whether any type of reptile can ever really qualify as a "pet," but there is something companionable about the swift which almost makes it eligible.

THE SIX-LINED RACE RUNNER, OR WHIP-TAIL

Family: *Teiidae*,
Genus: *Cnemidophorus* Wagler,
Species: *Cnemidophorus sexlineatus* (Linné).

Taxonomy.---In the Western Hemisphere the Teiid lizards are a considerable family, but the genus *Cnemidophorus* is their only representative in the United States. A single species, *C. sexlineatus*, ranges northward from Florida, along the Atlantic Coast as far as Maryland, and in the Mississippi Valley to Lake Michigan.

Chief Characters.---These are contrasted with those of the swift in Plate 3, where the figure in the middle is a race runner. The specimen is an adolescent of about 6 inches total length, shown here at 64 per cent of its natural size. The whole outline of the body in this species is slender and graceful, and the pointed muzzle is more depressed than appears in the accompanying view from above. The limbs are long and powerful, especially in the rear, and capable of great speed. The scales of the ventral surface and the lower sides are rectangular plates transversely elongate; those of the upper sides and back are small, giving those areas a velvety aspect.

The example shown in Plate 3 happens to be imperfect, the last three fifths of the tail being regenerate. In perfect specimens the tail is slightly more than twice as long as head and body. The following figures, for five examples from St. Mary's County, are reduced from fractions of inches, and therefore not perfectly exact; but as the original measurements were carefully made, they serve at least approximately.

Male:	Snout to vent,	70	mm.;	tail,	165	mm.
Female:	"	70	"	"	155.4	"
Male:	"	63.5	"	"	139.5	"
Male:	"	62	"	"	138	"
Female:	"	51	"	"	108	"

Although, as will be noticed here, the female's tail is slightly less in proportion to the total length than that of the male, it is more

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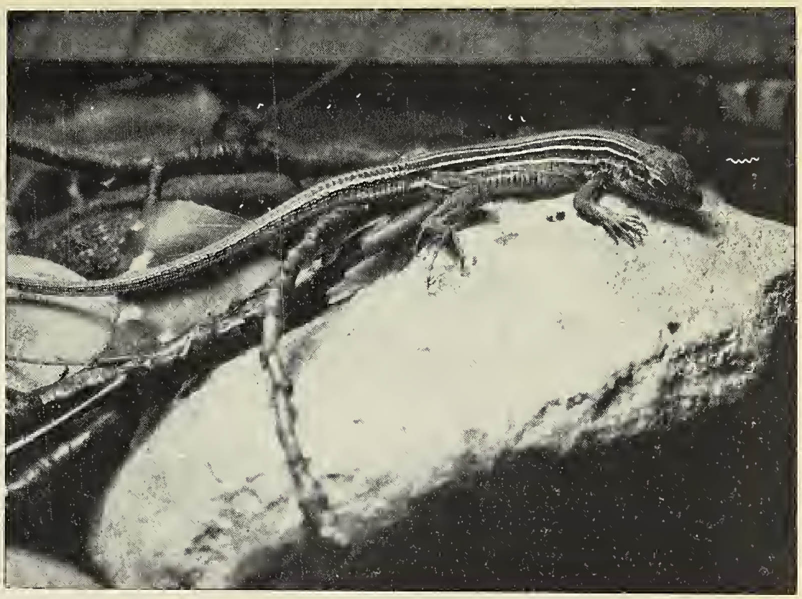
THE SIX-LINED
RACE RUNNER

(Cnemidophorus
sexlineatus)

(Photograph by
August Selckman)



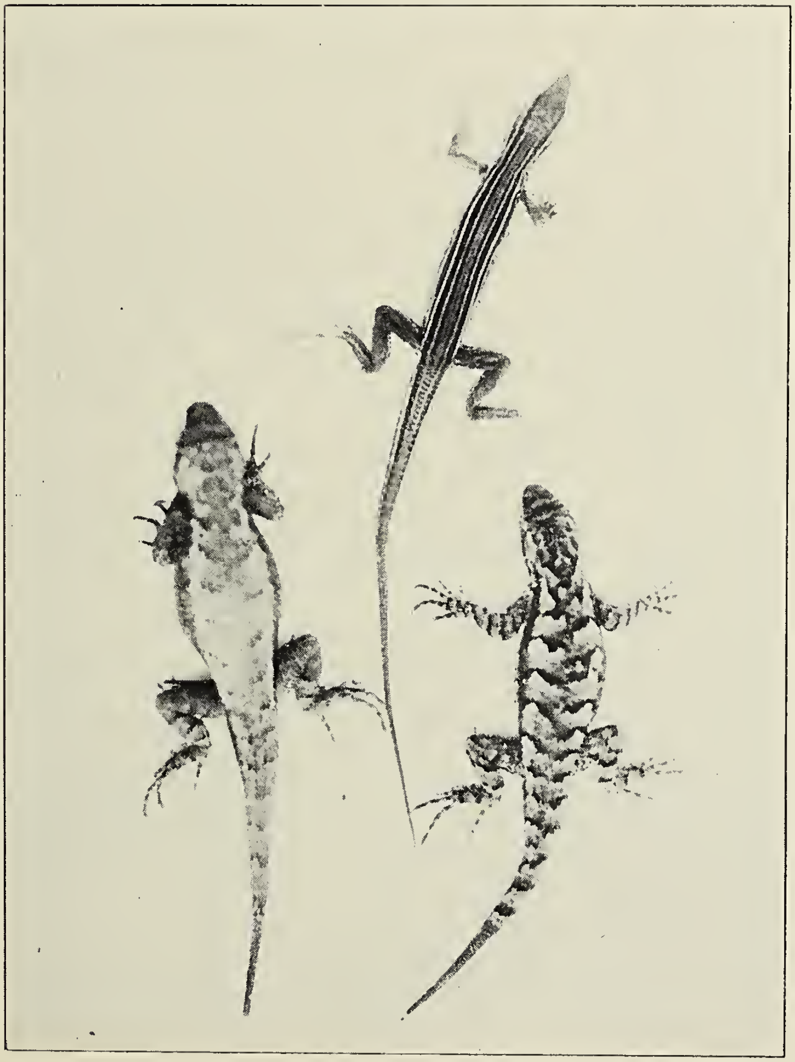


PLATE 3

THE SIX-LINED
RACE RUNNER

(Cnemidophorus
sexlineatus)

(Middle Figure)

THE NORTHERN SWIFT

(Sceloporus undulatus
fasciatus)

Male Female

(See Plate 1)

(Lower Figures)

64 per cent of natural size

than two thirds of the whole, and the average for the five specimens is a little more than 69 per cent.

Size.---From the figures just given it may be seen that the race runner is a lizard of greater average length than the swift, though at the same time much more slender. The longest of the above specimens measured in all 235 mm., or 9-1/4 inches. Ten inches is probably the limit of length in Maryland. It must be remembered, however, that at least two thirds of a perfect specimen's total length belongs to the tail. It is probable that the species is not sexually mature at less than a total length of six inches.

Color.---On a background of medium brown, six narrow lines of bright yellow extend from the middle or rear of the head along the body, becoming obscure at a short distance down the tail. Between each line of the median pair and the adjacent lower line, the dorsolateral stripe is of a deeper brown than the dorsal ground-color. The proportion and distribution of all the colors of the pattern presents to view at a short distance a resultant effect of dull olive, which blends well with the lizard's favorite backgrounds. The abdomen is of a pale bluish green. The male is distinguished from the female by throat and side areas of a purer and slightly deeper blue, and by a somewhat brighter contrast between the ground-color and that of the six lines. The young of both sexes have the pattern of the adult female.

Distribution.---We have found the race runner in limited areas which may be designated by the following points:

Anne Arundel County: Furnace Branch; Camp Linstead; Fort Smallwood; Fairview; Shore Acres, on the Magothy River; Lake Shore; Indian Landing.

Calvert County: Cove Point.

Prince George County: Priest's Bridge; Bowie.

St. Mary's County: Piney Point; Fort Point; Ridge; St. Inigoes; Point Lookout.

The colony of these lizards at Furnace Branch is near Glen Burnie, Anne Arundel County. Groves, who reports it, believes this to be the most northern locality in Maryland at which the species has been found.

Environment.---Less hardy and adaptable than the swift, the race runner is much restricted in distribution by its peculiar tastes. In the first place, it is strictly terrestrial. It never leaves the ground even to mount a slender log or rail, much less to climb a shrub or tree. Again, it avoids elevated ground, however bare, confining itself to low levels, and preferring exposed and rather sandy areas, with only the sparsest vegetation at hand to serve as shade or shelter. All of this excludes it from timbered land and cultivated fields. Stretches of sandy beach are favorite resorts, but their upper reaches

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are preferred, being furnished with tufts of marsh grass and low shrubbery. Near Bowie, in Prince George County, a colony frequented the high sandy banks of a railway cut which ran through a wooded section. Groves describes the home of the Furnace Branch colony as an open sandy field with a grove of sumac in its midst and the remainder sparsely dotted with scrub pine and coarse grass.

Mansueti reports a curious situation at Cove Point, Calvert County, where every specimen pursued fled toward a natural pond surrounded by a marsh, and disappeared among reeds and other aquatic plants. The lizards did not seem to enter the water, but they went so near it that insecurity of footing made it impossible to follow them to their actual shelters.

This phenomenon was exceptional. The race runner, like the swift, avoids moist localities and revels in dry and sunlit sand. However, like that of the swift again, its endurance of heat is limited. Mansueti writes, on this point, "I have noticed that on very hot days they tend to seek shady portions, and delight in darting back and forth between such retreats, through streaks of sunlight." At times he has followed them to burrows in the earth, which he believes may have more than one entrance.

General Conduct and Disposition.---The race runner is the fleetest of Maryland lizards. Like the swift, it runs with the body straight, and apparently with the tail just enough elevated to clear the ground. At full speed it defies observation, running literally "like a streak." Then, without seeming to slacken speed, it suddenly stops short in mid career at the roots of some cluster of weeds, while the pursuer's eye follows on in the direction of the interrupted course, and he wonders what has become of the lizard. When a halt is made and observed, snaring is possible by means of a fine noose of packthread, and I have taken the California species, C. tessellatus, by this method. But the position usually taken at rest, close beside overhanging vegetation, often makes it impossible to pass a noose over the head. A light but long-handled net of mosquito-netting is a helpful implement. When two or three pursuers "corral" a specimen between them it becomes somewhat bewildered, and may be caught with the hand in passing. The best of all opportunities for capturing this fleet little reptile seems to be afforded by cloudy or chill weather on a much frequented beach. By turning over the driftwood which then serves as shelter, a fair number of specimens can be caught by hand.

I have never known a race runner to attempt to bite. They are a timid folk, and seem to lose all courage when once mastered. Nevertheless, they can become tamer in captivity. A Californian example, so wild during the first two weeks of captivity that she could hardly be fed at all, became so tame before the end of the season as to take her food from my fingers, and even to leap up an inch or two in order to reach it.

Food.---Among the articles of this lizard's diet are grasshoppers, crickets, house flies, mealworms, and (at least in captivity) sowbugs and roaches. In its natural surroundings it is very fond of ants. On a beach in St. Mary's County one of these lizards stationed itself conveniently across the line of a foraging column and picked up the ants as fast as they arrived. Mansueti mentions a similar case in

which he noticed that the lizard "lapped up" the passing ants with its tongue. This organ seems to play more part in the capture of food than is usual with other local species of lizards.

Reproduction.---The comparative difficulty of capturing the race runner alive, together with its limited ranges, reduces the amount of our joint material on this subject. We have no records of the breeding habits of the race runner. Little can be said also about its eggs or the date of their deposit. Three females captured on July 9th had not yet deposited their eggs. That season (1935) was somewhat backward in St. Mary's County, but the normal date of deposit is probably not much earlier than this, to judge from the following instance.

Eggs.---A female captured about July 8th (1932) deposited 3 eggs a few days later. The first egg was discovered on a warm morning, July 16th, and was lying in a shallow vessel, partly submerged in water. The other two eggs were laid the following night, in moist sand beneath a strip of bark provided for shelter. After a week in artificial incubation they still retained a faint creamy tint. At this time they measured respectively 17 x 9.5, 16.5 x 9.5, and 18 x 9.5 mm. These figures reveal a more elongate form than that of the swift's eggs, and a much greater volume, the eggs being larger at the end of their first week than I have ever known a swift's eggs to become in their whole period of incubation. This circumstance, and the small number of eggs deposited, are interesting in contrast to the mother's size. She was about 8 inches in total length. Induction cannot be founded on a single case, but if this one was at all typical, it would appear that the race runner is not a prolific species.

I did not succeed in hatching any of these eggs, nor can any of us yet report on the race runner's period of incubation. As to the medium, it seems safe to infer from its general environment that the race runner buries its eggs in faintly moist and sandy soil.

We have nothing to report on the period of sloughing in this species, or the manner of effecting it.

Enemies.---The species of serpents already mentioned as preying upon the swift may be taken for granted as equally foes of the race runner, within the limits to opportunity which the latter's restricted distribution and fleetness in escaping must impose. If the species is low in fecundity, it has its compensating safe-guards to multiplication. Mansueti reports a captive Georgia specimen of *Eumeces laticeps*, a much larger and stronger lizard, as discovered in the act of devouring a captive race runner, but it is safe to say that the aggressor could never have captured such prey in the open.

Tail Fracture and Regeneration.---This phenomenon occurs also in the case of the present species, and may be observed (as noted above) in the example shown in Plate 3, between the figures of the two swifts.

Hibernation.---On this subject also we cannot report from observation.

General Remarks.---This species would well repay special attention.

Only a few localities, comparatively speaking, are promising sources of supply; but in any such the individual examples may be very numerous. Properly equipped for capture, a collector might take a respectable series of specimens of both sexes within a few hours. Were this accomplished early in the spring, and the lizards given the needed conditions in captivity, many of the blank spaces in our information could be filled.

THE GROUND SKINK

Family: *Scincidae*,
Genus: *Leiolopisma* Duméril and Bibron,
Species: *Leiolopisma unicolor* (Harlan).

Taxonomy.---Two genera of Maryland lizards, embracing three species in all, belong to the large and widespread family of the Skinks. Its members have two chief distinctive properties. First, the scales are smooth and highly polished, reflecting light as from a varnished surface. Second, the limbs are comparatively small, and lack the power to propel the body swiftly for any considerable distance in a straight line. This compels the skink to augment its speed by a lateral undulation of the body and tail, giving it a wriggling and serpent-like locomotion.

These two properties together give the skinks a superficial resemblance to amphibians, but the size and coloration of most of the species prevent their being mistaken for salamanders. One species of skink, however, whose small size and uniform color may lead to such a mistake in identity is *Leiolopisma unicolor*.

Chief Characters.---This species, as appears in Plate 4, may be said to exaggerate the peculiarities of the skink family. The view exhibits the ventral aspect, and is here enlarged to 90 per cent of the natural size. The high polish of the scales is evident. The limbs are even smaller in proportion to the frame than is usually the case in scincoid lizards. The snout is pointed; the head is hardly broader than the neck. A dorsal record of this same example was taken, but has not proved serviceable for effective enlargement.

Size.---The ground skink is one of the smallest of lizards. The example in Plate 4 is an old and uncommonly large one. The average adult proportions may be fairly represented by comparing the dimensions of this specimen (restored to natural size) with those of two others, one in the collection of Woodstock College, the other measured and preserved by Groves:

	Snout to Vent	Tail	Total
Plate 4 (at nat. size)	46 mm.	78 mm.	124 mm.
Woodstock Coll. L 7	44 "	(56 ")	(100 ")
Groves' specimen	39 "	57 "	96 "

The second of these examples has a regenerate tail, so that neither the length of that member nor the total length is normally

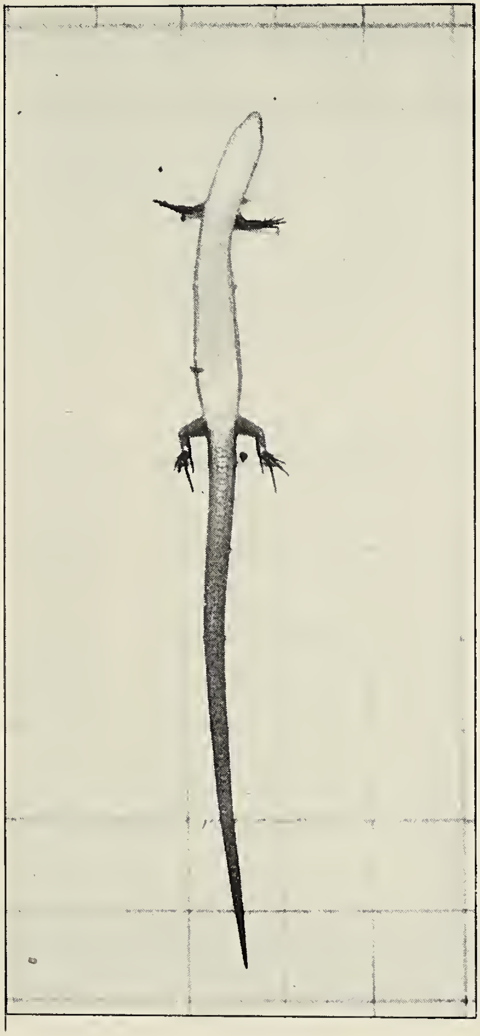

PLATE 4

THE GROUND SKINK

(Leiolopisma unicolor)

Ventral Aspect

90 per cent of natural size

complete. The first and third examples, however, are perfect specimens. It will be noted that the length of the tail in the first case is 62.9 per cent of the total; in the third, 59.3 per cent. The first of the three is altogether 4-15/16 inches in total length, and this may be regarded as approximately the limit of length for the species in Maryland.

Mansueti has also preserved several specimens, which are now, I believe, in the collection of the Society.

Color.---Groves' description of the coloration of the third example above may be quoted entire: "Dorsal surface of head, body and tail, bronze colored, with a metallic glint. Two black lateral stripes, one on each side, extend from the snout to the anal region, where they begin to lose distinctness, becoming obscure on the tail. Below each line is a rather narrow area of bronze, somewhat lighter in shade than the dorsal color, and speckled with black. Throat, white; belly, light gold; underside of tail, gray." It may be remarked that the clear yellow of the abdomen is not a constant character, being fainter in some examples.

Distribution.---We are able to report the ground skink from the following localities:

Calvert County: Plum Point.

Charles County: Wolf's Den, Cedarville State Forest.

St. Mary's County: Leonardtown; Ridge; Chancellor's Point, Beachville.

The species seems most abundant in the southern part of the Coastal Plain, but we cannot speak precisely of the limits of its range.

Environment.---While skinks in general require more moisture than most lizards, and probably absorb a little through the skin in addition to what they drink, one would think Leiolopisma slightly less dependent on this condition than the species of Eumeces. I have found a ground skink in a pine grove at a good distance from any water. Mansueti took a specimen from beneath a scrap of cardboard in dry surroundings on a hot morning. He also reports one taken by Conrad Kenney and Joseph Bures on the open beach at Plum Point, though near the water's edge.

The fact is that there is usually moisture enough in the mold beneath the surface of any wooded tract, or under the bark of decaying wood, to supply the needs of so small a reptile. The ground skink, indeed, is often passed by unnoticed. The first one which I was able to recognize (about 1921) was just at the edge of heavy timber, and basking on the upturned margin of a large fallen leaf, which its weight did not even unbalance. In southern Maryland the species is really more abundant than its rare appearances in the open would seem to indicate.

On a sunny morning, at every few steps along a pathway in the woods, the practiced ear detects a faint, quick rustle in the leaves.

In most cases the cause is a wary insect withdrawing to cover; but oftener than one would suspect, the cause of disturbance is a ground skink driven from a sunlit spot to the nearest shelter. Unless the exact place can be noted at once, the search of a wider area is seldom or never worth the time. Should a passing glimpse be caught of a small brown object wriggling out of sight, the collector's mind may automatically register the judgment "salamander," until he reflects that no amphibian would have been exposed to view at all in such surroundings. His chance then is to mark the spot where the fugitive disappeared, seize the largest handful of surface covering that he can hold, and examine it bit by bit, fortunate if anything better than leaves and mold rewards him. In case of success there is no bite to be feared by the captor, but only possible injury to the delicate little captive. Sometimes a better opportunity lies in stripping bark from decaying logs, a method which once gave me two specimens in one morning. But if the lizard is at rest in open view, snaring is out of the question.

Food.---In its natural state the ground skink feeds on small insects of various kinds, and probably has easier access to ants than the larger lizards. A captive specimen is reported by Groves as eating house flies and soft-bodied larvae. He remarks on the timidity of this lizard, and also reports, for the first few meals, a nervous twitching of the tail when the food was just about to be seized, a practice which disappeared later in captivity, and was probably due at first to conflict between hunger and fear.

Reproduction.---In the summer of 1923 this writer's lack of foresight and his engrossment with other interests led him to neglect what has proved to be his only chance of exact information on this point in the ground skink's history. A female captured at the beginning of July deposited three eggs next day. They were unfortunately never measured, but were kept in hatching medium, the mother being then released. One of these eggs perished, but about six weeks later, at a date also unrecorded, the other two hatched, and one of the young was observed in the act of emerging from its neatly slit shell. The young were fond of resting in a coiled position, a favorite habit of skinks in common. It is indeed to be regretted that no dates or figures were collected from this unique experience.

Survival.---The enemies of the ground skink probably include the young of the serpents mentioned above as preying upon lizards generally, and also adults of the so-called burrowing genera---Carphophis, Virginia, Diadophis, Storeria---too small to capture and swallow the larger types of lizards. As already intimated, the ground skink too has the common protection of a fragile and regenerable tail.

General Remarks.---We cannot speak from observation of the period or method of sloughing in the ground skink, nor of its hibernation, although its habits in both of these functions are probably very like those of the two other skinks, both species of Eumeces, which will next engage our attention. Members of the Natural History Society of Maryland are still at the threshold of experience with Leiolopisma unicolor, as this all too sparse account attests.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

THE COMMON SKINK, FIVE-LINED SKINK, BLUE-TAIL, "SCORPION," "ADDER"

Family: Scincidae,
Genus: *Eumeces* Wiegmann,
Species: *Eumeces fasciatus* (Linné).

Taxonomy.---How many species of the scincoid genus *Eumeces* inhabit Maryland is not yet fully ascertained. In Virginia and West Virginia occurs one species (*E. inexpectatus*) not yet reported north of the Potomac, while another (*E. anthracinus*) is represented by a single example recorded some years ago from Allegany County. It is at least certain that *Eumeces* is indigenous to central and southern Maryland in two species, *E. fasciatus* and *E. laticeps*. The specific isolation of the latter is accepted in this paper, and some attention will be given to its justification.

Eumeces fasciatus needs an appropriate English name. "Scorpion" and "adder" are, of course, only expressions of popular fancy. Both of our local species are "blue-tailed" in their early years, and both are "five-lined" for life in the adult female. For *E. fasciatus* the writer prefers the name "common skink," since, either for Maryland or for the United States at large, this species of *Eumeces* is the most abundant and widely distributed of all.

Chief Characters.---In this species the common properties of all skinks (polished scales, relatively weak limbs and undulatory motion) are fundamental, but less emphasized than we have seen them in the ground skink, and modified by features more common to lizards generally. Plate 5 exhibits these characters in two adult examples, female (left) and male (right), here shown at about the natural size. Both head and body are more typically proportioned than in the ground skink, though the form is less robust than that of the swift. The skull is somewhat flattened, the muzzle pointed and not much depressed, and the eye socket only moderately prominent. The width of the skull at the ears is greater in the male than in the female at maturity, whereas no difference is perceptible in young specimens. The limbs are sturdier than those of the ground skink, but less developed than in the swift and the race runner; and the common skink augments its speed in flight by the serpentine lateral undulation which is characteristic of the family.

Size.---In Maryland the common skink does not seem to exceed a total length of 8 inches (202 millimeters), the typical example averaging about 6-1/2 to 7 inches when perfect. An ordinary adult female from western Charles County measures 70 + 106 mm., close to 7 inches entire; a larger one taken by Groves near Leonardtown, 78 + 106 mm., or 7-1/4 inches. According to Taylor (*The Genus Eumeces*, pp. 66-67), the female is one or two millimeters longer in head and body than the male of equal age.

Comparative calculations, especially in this species, must be based on measurements from snout to vent, since in perfect specimens the proportionate length of the tail to that of the whole varies much. In three specimens measured by Groves it is respectively 53, 54.8 and 57.6 per cent of the total; in four of my own it is 60, 61.8, 63 and 63.6 per cent. All of these are adult or adolescent examples. The first and third of Groves' list and the first of mine are females, but Groves' second is a male, so that difference in ratio does not seem to

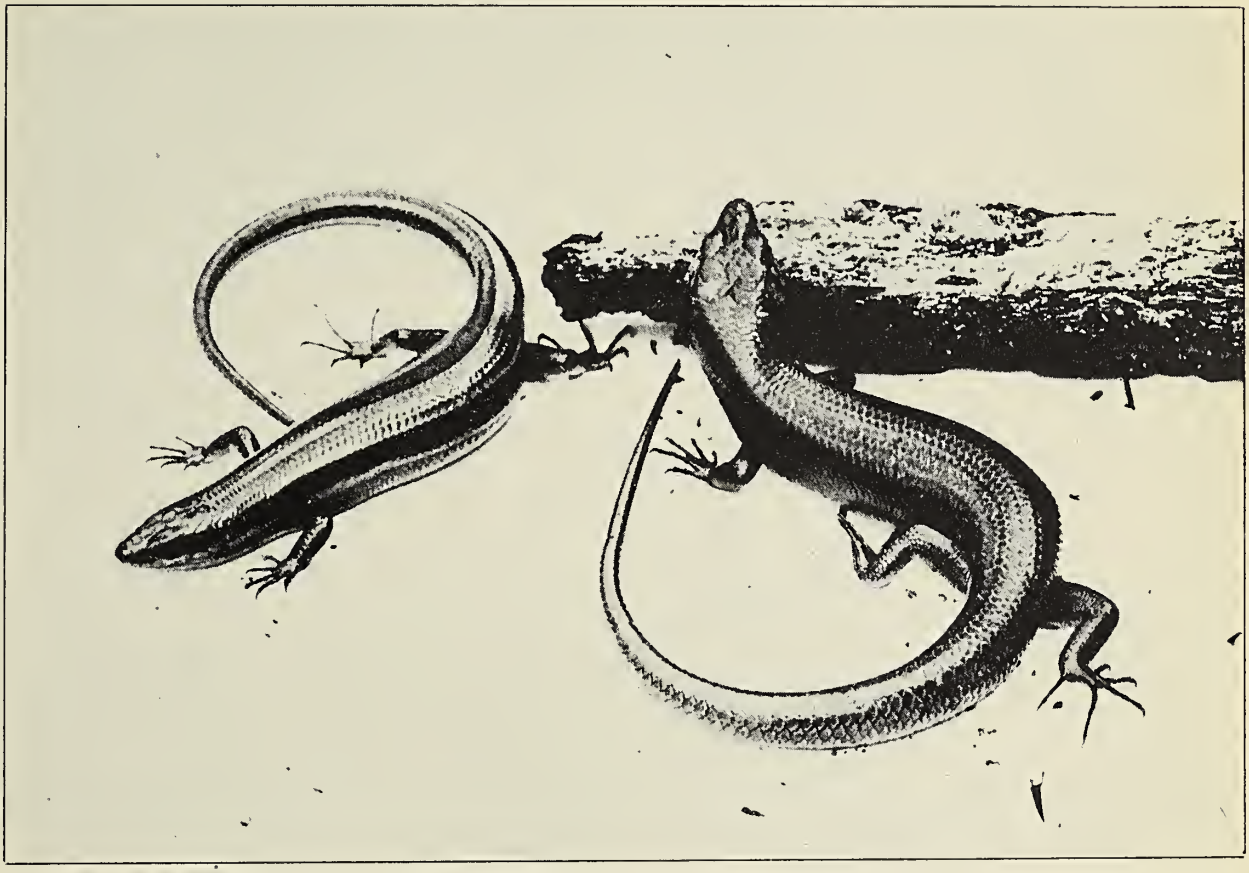

PLATE 5

THE COMMON SKINK

(Eumeces fasciatus)

Left, Adult Female　　　　Right, Adult Male

Natural Size

favor either sex. As to the proportionate length of the tail in the young, seven specimens of two days old, measured by Groves, ranged from 51 to 57.5 per cent in the ratio of tail to total, and averaged 55.3 per cent, although their snout-to-vent measurements varied only from 24 to 26.5 mm. The relative length of the tail appears less uniform in the common skink than in some other local species, and is probably more dependent upon the individual's opportunities for nourishment.

Color.---At a total length of about 5-1/2 inches (in the eighth or ninth year of life, to adopt Taylor's computation) this lizard undergoes so marked a change in color as to appear a different species to the average observer. To complete the change requires some three years, the most marked gradations accompanying successive sloughings.

The young of both sexes on emerging from the egg have a jet black body bearing five narrow longitudinal lines of pale yellow (white or greenish white in some other regions). The median or dorsal line is double from the nose to the occiput, where the forks unite in a single line following the course of the spinal column. The adjacent pair on either side, or dorsolateral lines, begin a parallel course directly above each eye. The lowest opposite pair, the lateral lines, begin beneath the eye, are interrupted by the ear, and pass thence along the sides. At the root of the tail all five lines abruptly change their color from yellow or white to a bright Antwerp blue. For about half the length of the tail these blue lines maintain their width, the black areas of ground color between them tapering to a point with the decreasing girth of the tail. From this point the blue overspreads the whole surface of the remainder of the tail, the Antwerp tone at the same time blending into a vivid cobalt. Forward of this section the under surface of the tail is pale blue, the abdomen and throat being dull white.

This beautiful and highly contrasted pattern belongs to both sexes for six or seven years of life, so that the common skink is "the blue-tail" up to a total length of about 5 inches. Here begins the period of transition. In both sexes, during the three years that follow, the five lines lose their brilliant colors, the yellow approaching buff while the blue fades to pearl gray. During the same time the intervening areas of black are gradually fading to chestnut brown. Now the opposite sexes begin to assume different patterns. The ground-color of the female gradually becomes olive brown, against which five lines of paler buff or gray extend from the nose to the tail and along a considerable part of its length. The lower jaw tends to pale tan. The areas enclosed between the dorsolateral and lateral lines become broad stripes of a deeper brown than the dorsal area, while the dorsal line is sometimes almost obscured except for a faint indication of its original margins. This pattern the female retains for the rest of her life. The male exhibits the same fading of the black ground-color to chestnut, and then to olive brown, but the five lines become more and more obscure until they vanish entirely at about the tenth year, leaving the back and sides uniform olive, often with a few irregularly scattered scales of a darker brown. At the same time the skull of the male begins to broaden at the ears and to assume a pale reddish tint, which first replaces the dull white of the lower jaw, then mounts to the occiput, and finally overspreads the cranium. As the male of this species is much oftener seen in the open than the

female, the outcome is the type of lizard popularly known as "the red-headed scorpion," and not suspected by the average observer of being merely an adult example of the "blue-tail." Few reptiles pass through so complete a transformation in color.

The least trace of blue about the tail of either sex is a sign of comparative youth, but by no means of sexual immaturity. I have found it in many mothers discovered in hiding with their eggs, and have seen one case of captive breeding, and one of native maternity, in females on whose tail the pure blue of the juvenile pattern had hardly yet begun to fade. Again, the exact proportion or tint of the surviving blue is not an infallible norm of precise age. In the summer of 1941, at points less than half a mile apart, I took two brooding mothers, measuring respectively 67.4 and 65.7 mm. from snout to vent, of which the latter's color pattern was decidedly more advanced, although she was the shorter of the two. The initial and the final coloration are fairly constant for all examples, but the intervening steps may vary somewhat in individual cases.

Distribution.---Making due allowance for its preference for wooded tracts, and its general abhorrence of the Piedmont Plateau (a fact for which I cannot account), the common skink is almost as widely distributed in Maryland as the swift itself, although relative abundance favors the southern parts. We have it reported from the following localities:

Anne Arundel County: Furnace Branch; Camp Linstead; Shore Acres, near Arnold, on the Magothy River.

Baltimore County: Western Baltimore, near Gwynn's Falls Park (see below); Upper Patapsco State Park, near Avalon; Chase, Gunpowder Falls.

Calvert County: Cove Point.

Charles County: Benedict; Cedarville State Forest; McConchie; Pomfret; Chapel Point; Wills Run, near La Plata.

Frederick County: Catoctin Recreational Area.

Montgomery County: Plummer's Island.

Prince George County: Laurel; Priest's Bridge.

St. Mary's County: Many points near Leonardtown; Dameron; Ridge; Chancellor's Point; St. Inigoes; Beachville.

(On the Eastern Shore: Chestertown, Kent County, and Cambridge, Dorchester County.)

It will be noticed that in Frederick County the species is found in the Appalachian region. In Baltimore County its range---following, as Prof. McCauley notes, the valleys of the larger watercourses---touches the edge of the Piedmont at the Patapsco State Park and in the valley of Gunpowder Falls. It does not penetrate the Piedmont to any considerable depth. Through thirty years of collecting I have met with it nowhere near Woodstock College, in western Baltimore County.

The strangest resort of the common skink that has come to our attention is a group of partly vacant lots in western Baltimore. The lizards were discovered there about two years ago by Robert Buxbaum, who kindly supplied full information after several specimens had been certainly identified by Mansueti. The district is roughly bounded on the east by Bentalou Street, on the south by Fayette Street, on the west by Franklintown Road, and on the north by the Pennsylvania Railroad, though the colony must extend farther west than these limits of actual collection. A single example was taken as far east as the intersection of Bentalou and Lexington Streets, but the greater number came from the southwestern corner of the district, which adjoins the southern section of Gwynn's Falls Park. From the latter source the lizards probably spread eastward at a date when building had not deeply invaded the district. Water is still near at hand, and in areas not yet occupied the lizards use the shelter not only of stumps and stones, but of waste tin and other refuse of human habitation. Rarely a specimen is reported from some neighboring cellar, probably its winter quarters.

Since this report was received, building in the district has recommenced, and the skinks may soon be driven westward; but their presence there hitherto is noteworthy. That a reptile so timid and secretive and so addicted to the silence of the woods should have persisted thus long in such a locality, would seem to indicate that the common skink does not tend to migrate far from the place of its origin so long as anything can supply its prime necessities. As a converse manifestation of this same tenacity of habitat, the writer has tried for the past fifteen years to colonize the common skink in the vicinity of Woodstock College, but hitherto without success, although nearly a hundred specimens of various ages, brought from Charles and St. Mary's Counties, have been released in all. The species does not seem to thrive within the Piedmont Plateau.

Environment.---In the common skink we have no frequenter of hot and arid pine groves, like the swift, nor skimmer over sun-baked reaches of sand, such as the race runner, but a denizen of the fresh green forest, loving its patch of sunshine, but only where shade and moisture are not far away. Its striking beauty and extreme shyness make it one of the most alluring mysteries of the woods, and dull or jaded must be the taste of the collector who finds no thrill in its pursuit. Its speed in flight, though inferior to that of the swift and the race runner, is quite enough to tax pursuit, and its wriggling course helps to distract the eye, while the watchful fugitive easily changes its direction or even doubles on its track to avoid the impending swoop of the hand. When it can be approached at rest, the lizard's head is so slightly distinct that any but the finest noose capable of bearing its weight will easily slip from the polished scales of the neck, except in case of the older male examples, whose broad temples offer a better hold.

General Conduct and Disposition.---In really warm weather the common skink is satisfied with a couple of hours' exposure in the morning and a somewhat longer period in the late afternoon. Although an excellent climber, and quite at home on the trunks or heavier limbs of trees, it seldom ascends very high, and is more terrestrial than arboreal in its tastes. It is very tenacious of some well known spot, and when dislodged will often return there and offer another opportunit It is certainly most at home near the surface of the earth. Beds of

decayed wood pulp, if sheltered from above, are favorite abodes. In cloudy weather, and even on clear days comparatively cool, the common skink lies buried in such recesses until the outer air is thoroughly warm, before emerging. Mansueti records several specimens found at a depth of six or seven inches in the pulp of decayed red oak, at 9:30 a. m. on June 2d, but notes that the outside temperature was then only 72° Fahr. Two more hours would probably have brought them out, and made them much more active and difficult to capture.

On standing trees, not only patches of loose bark, but woodpeckers' abandoned holes, and the shallower craters which abound in old white oaks, are favorite shelters. During the season of incubation very few of the females ascend the trees for pulp-beds suitable to the development of their eggs, usually depositing them in fallen logs or low stumps. The care-free males, on the contrary, when the summer is well advanced, often share the trees with their larger relative _Eumeces laticeps_. Yet both species tend to seek the earth when _suddenly exposed to pursuit_. The writer once assisted in stripping a large dead loblolly pine of its loose bark to the height of about twenty feet. The last strip, dislodged by a pole, uncovered a male of each species clinging side by side to the trunk. Above them rose ten feet of denuded trunk, and above that a wealth of loose bark at a height that would have set them far above our reach. Yet instead of making for this surer refuge, both lizards, after a few seconds' exposure to the light, turned and rushed down the opposite side of the trunk to the ground, and then ascended low growth near at hand, where they were easily captured.

With loose bark chiefly in mind, the writer had for years passed by denuded logs as not worth examination, until a few accidents proved their fruitfulness. Such barkless logs are often hollow, and any split in the hard outer shell of wood gives entrance to beds of soft decaying pulp. If this interior can be reached and explored, many a catch rewards the labor. In one such receptacle both a _fasciatus_ and a _laticeps_ were taken, on a showery afternoon in May, _buried several inches deep_ in oaken pulp. When disturbed they almost ran into my hands.

In fact, the common skink probably hears or sees a human intruder often at a respectable distance, and takes cover before being seen; but acquaintance may be improved by searching any dead log near at hand. When thus uncovered in its retreat, the lizard is usually bewildered, and wriggles under the nearest bit of cover, sometimes making a poor selection and so falling captive. When clasped in the hand it will bite if possible, and it rarely fails to wrap its fragile tail around the fingers, prompted by instinct to offer that member to the captor's grasp and leave him nothing more for his pains. The bite, however, is negligible, never even breaking the skin; and a little experience teaches the collector to avoid all pressure on the tail, and so secure his captive unimpaired.

Captive specimens of the common skink not only require water, but learn in a few days where to find it in a vessel, and afterwards use it frequently if not regularly. In the absence of such a vessel they may be given water daily with a dropper or the tip of a small brush, from which they lap it cat-like with the tongue. The sawdust in their cage should be kept moist beneath the surface,

or else beneath a bark shelter, to match their surroundings in the wild state. Sand, the delight of the captive swift, is misery to a skink, which never looks nor acts its best on such a flooring. Water is not strictly a daily necessity, but its absence for several days together may be fatal. I have lost several captive specimens by its neglect.

Timid and watchful as it is, the skink relaxes thoroughly when at rest. It may often be seen with the hind legs folded back full length against the tail, a position from which they must be withdrawn before a step could be taken. In straitened quarters it coils almost as neatly as a snake, and even seems to prefer this posture to an extended one.

Food.---Spiders and most kinds of insects enter into the diet of the common skink, including grasshoppers, crickets, katydids, small moths, various beetles and their larvae. Groves reports also house flies and earthworms taken in captivity. Mealworms and their beetles are welcome through the active season, before the appetite begins to wane in the fall. Even after this, crickets are still acceptable for a time. In feeding very young skinks I have had the best results with termites. It is true that these are dangerous neighbors indoors, but very few of them escape the young skinks, which snatch them up greedily, and even dig them out of pulp with forefeet and snout. They never seem to tire of this diet, and are observed to grow rapidly on it.

Adult skinks are fond of the larvae of large beetles. They will attack one much longer than their own head, seizing it by one end and shaking it so violently that it is either killed or flung apart, when the pieces are swallowed successively. Like other lizards, they masticate their food. Of the softer articles of diet they can assimilate considerable quantities. On the other hand, they can fast completely for days together, as they commonly do in stormy weather. From three to six mealworms daily, or an equivalent quantity of other food, keeps the average specimen in perfect condition. The female shortly before depositing her eggs, and both sexes on the approach of winter, lose all appetite for food. Some lessening of appetite may also accompany the approach of sloughing.

Reproduction: Breeding.---Out of a mass of notes collected during twenty-one years, my only records of breeding in the common skink are those of captive specimens, as might be expected. This makes it hard to judge of the time when the mates first consummate their union in the natural state; but circumstances reduce the margin of allowance to be made for error. The first instance I ever witnessed, in 1921, involved a young pair. The female was barely mature, with her black and blue colors of youth still unmodified, and the male's stripes were beginning to fade, indicating about his seventh or eighth year. Both had been taken in St. Mary's County between March 28th and April 3d. They bred in their cage on three observed occasions, May 7th, 10th and 15th. Captivity would aid opportunity; but, on the other hand, they bred in Baltimore County, where the spring is at least two weeks later than in St. Mary's. It does not seem far wrong to place the natural time of breeding in this species at about the beginning of May in any normal season. The female later laid five eggs, at a date of which no record was kept, and this probably represents the average number of eggs in a first brood.

Another case, from the season of 1925, involved a male 7 inches long, a female of the same length, and a younger female measuring 5-3/4 inches, all perfect examples. These were taken in Charles County on May 5th and 6th, and caged in Baltimore County. The male bred with the older female on May 17th, 19th and 22d. He ignored the younger female until placed separately with her, after which they bred twice on May 31st. Considering the date of their capture, either of these females may have had an earlier mate.

Again, two females already gravid were taken in Charles County on May 15th, and deposited their eggs respectively on June 19th-20th and 22d-23d. These would probably have bred within about the first ten days of May.

Breeding, however, may occur earlier than the first of May. In 1927 an old pair, the male measuring about 7-1/4 inches and the female nearly 7-3/4, were taken at separate localities in Charles County and caged at Woodstock. On May 1st, when they had been ten days together, the female suddenly attacked the male, which fled from her. Later in the same day, when both were lying quiet, she approached him quite deliberately and bit him in the region of the genital organs, as if to disable him, though leaving no external sign of mutilation. Although this female had been taken as early as April 20th, it would seem that even then she must have been already fertile, in view of her adopting such decided means to forestall any attention on the part of her fellow-captive. Whether she ever subsequently laid eggs my records unfortunately do not show. As to this trait of conduct, I have observed it in no other reptile except in a female specimen of the Californian skink, Eumeces skiltonianus, which treated a captive male of her own age in precisely the same manner.

Gestation.---My only records of the complete period from fecundation to deposit are derived from the two females mentioned above as breeding with the same male in 1925. The older specimen, which bred on May 17th-22d, deposited 3 eggs on June 30th, 4 on July 1st, and one on July 5th. Two of the first three are recorded as measuring 13 x 7 and 13 x 8 mm.; but these measurements were not taken with calipers, and are probably somewhat too large. None of these eggs ever hatched. At the time of deposit the embryo in several of them, lying near the surface, showed through the integument as a deep red spot, and the glass distinctly revealed the main blood-vessels permeating the food-yolk. The younger female, which had bred with the same mate on May 31st, deposited 6 eggs "about July 7th." These two sets of dates show a period of gestation varying from six to seven weeks. Probably this need not be extended to allow for earlier breeding previous to capture, since the dates of deposit are normal enough in these two cases, as will appear below.

Unlike the swift, one never sees two skinks of opposite sexes hunting in company. Indeed, I have never yet found an adult female of the common skink except under cover, though others have taken a few examples in the open. At all events, it would seem that the mates of this species do not associate together long. Their partnership would terminate, in any case, with the female's custody of her deposited eggs.

Eggs.---The eggs of the common skink, unlike those of the swift

and the race runner, are easily and often found where the mother has placed them. As to the number produced in a season, I have found several clutches of 11 eggs in different years and places. Groves records a captive female from Leonardtown, St. Mary's County, as depositing 12. A few days before this writing, a female from Charles County, measuring 70 + 106 mm., deposited 15 fertile eggs, the largest number known to me.

The date of deposit is usually about the last week of June. Of females which had bred at large I have found three clutches on June 25th, two on June 30th, others on July 2d, 5th, 6th, 7th and later; but all of those found in July were well enough advanced to have been at least a week old. The two captives mentioned above as depositing on June 30th to July 5th, and on July 7th, respectively, were not much delayed, though the second had bred as late as May 31st. Of captives which had bred in the natural state, one deposited on June 19th-20th, a second on June 22d-23d, and a third on June 29th-30th. The last week of June, which thus appears to be the average period, is about three weeks later than the time of the swift, and probably a week or two earlier than that of the race runner.

Incubation.---Taylor affirms that "the eggs of *Eumeces fasciatus, laticeps and obsoletus* are at least in some measure *incubated by the skink*" (*The Genus Eumeces*, p. 65). One hesitates to question an opinion *of acknowledged authorities*; but, while the mother's custody of the eggs is a well known fact, it is hard to conceive what she can contribute to their development. She is usually coiled about the eggs; but, when discovered in this situation, her body is not in contact with them all. Nor would contact itself appear to contribute to either warmth or moisture (the two essential necessities). Nor, again, does development seem to suffer seriously, or the young to be less than normal, when the eggs have been removed and artificially hatched.

My personal belief is that the mother remains with the eggs in order to protect them. The common skink does not, like the swift and the race runner, so conceal its eggs as to leave neither access nor clue to their presence. The spot selected is a cavity containing decayed pulp, protected from without by bark or a thin shell of wood which transmits indirect warmth from its own exposure to the sun for a few hours of the day, while the pulp remains faintly but constantly moist. To any such cavity the original entrance must remain open, exposing the eggs to predaceous beetles and other enemies, against which, however, the mother is well able to defend them.

Groves mentions a captive specimen which deposited her first three eggs under a piece of stiff paper. When this was removed, she was at first loth to abandon the eggs, and then seized one of them in her mouth, though with what aim it was impossible to say. I have never witnessed this last trait of conduct, though I have often noticed a disposition to linger with the eggs when first exposed to view.

Whether the mother ever leaves her eggs during incubation, for food or other objects, I cannot say from personal observation. I have found one clutch of normal eggs which had no guardian at the time; and once (on July 2d) a female, mature but no longer gravid, whose eggs I could not find, even in a spot that was easy to explore. But these two instances may be otherwise explained than by supposing that the mother was abroad in quest of food. Continuous custody from

deposit to hatching seems to be the regular habit.

Wishing to see how far this instinct might persist in captivity, I once experimented with a clutch of 7 eggs. They were found with the mother on July 2d, and a slightly older female without eggs (the one just mentioned above) was taken on the same day and in the same neighborhood. That evening I floored the cage with moist pine pulp, similar to that in which the eggs had been found; placed two shelters of bark on opposite sides of the cage, with the eggs under one of them, and then introduced both females. The next morning the eggs were alone, and the mother hidden under the vacant shelter opposite. That evening, however, I found her with her eggs under other shelter, after a night's separation from them. Here I observed her daily for a week, without dislodging her, but could not maintain the moisture of the pulp without too much disturbance. At the end of seven days it began to dry, and one of the eggs showed the effect by areas of collapsed integument. The next time that I investigated, the mother had abandoned her eggs, and the older female, whose eggs had not been found, had taken them in charge. It is impossible to say whether the actual mother had recognized the eggs as her own at the first, but she at least persisted in remaining with them for seven days, although investigated daily.

During this present season two other specimens have deposited in captivity, and it has been feasible to leave them with their eggs for two or three days afterward. They selected spots close together under a heavy piece of bark, the surface of which enjoyed about five hours of sunshine daily, and which covered sifted sawdust about an inch deep, thoroughly moistened. Here each of the lizards excavated a hollow nest for her eggs, and submitted to being inspected several times daily, the one for two days, the other for three. One of them never left the vicinity of the eggs on these occasions, while the other sometimes did so and returned. They were not always encircling the eggs, though often so, and each of them had collected her clutch after having first laid them somewhat separate. Neither was ever so coiled as to cover the whole upper surface of the clutch.

As to the size of the common skink's eggs at deposit, and the extent of their growth during incubation, we have as yet no record of the initial and final dimensions of the same clutch. From averages of each alone, however, approximate norms can be arrived at. For dimensions at deposit two cases are reported by Groves. The first female (1939) deposited on June 24th one egg measuring 13 x 7 mm.; on June 25th, 3 eggs measuring respectively 12 x 7, 13 x 8, 11 x 7 mm.; on June 26th, one egg measuring 11 x 7 mm. The average of this clutch of 5 is 12 x 7.2 mm.; the mother's length is reported as "approximately 6 inches." In the second case (1940) Groves measured only normal eggs selected from a clutch in which several others showed areas of collapse in the integuments at the time of deposit. (It may be observed here that such depressions, though pathological, are not always fatally so, the egg sometimes filling out to normal proportions after a few days' absorption of moisture.) From 4 eggs deposited on July 2d, one measured 11 x 7 mm.; from 5 of July 3d, one measured 11 x 8 mm., another 10 x 7 mm.; of 2 of July 4th, one measured 11 x 8 mm., one deposited July 5th was not measured. The 4 eggs measured yield an average of only 10.75 x 7.5 mm., but it will be noted that the whole clutch reached the exceptional number of 12.

To these may be added two cases of my own observation of dimensions at deposit. A clutch of 9 eggs deposited on June 19th-20th (1942) averaged 11.48 x 7.97 mm.; another of 14 eggs deposited June 22d-23d averaged 11.24 x 8.13 mm. It will be seen that in both these cases the shorter diameter bears a greater ratio to the longer than in the first instance of Groves. A mean average of these four clutches, 11.37 x 7.7 mm., gives a fair idea of the size of the eggs of the common skink when deposited.

As to dimensions at the end of the incubation period, it seldom happens that an egg is measured just before it hatches, and thus at its fullest growth; but there is probably not much increase in external dimensions during the last week or two. Out of all the records at our disposal, the following five clutches were measured nearest to the date of hatching:

Found	Date of measurement and average	Hatched
July 5	July 26: 14.1 x 10.7 mm.	Aug. 4-6
July 7	July 26: 14.8 x 10.9 "	Aug. 7
July 15	July 15: 14. x 10.5 "	July 24-25
July 20 (Groves)	July 20: 12.7 x 10.2 "	Aug. 2-3
July 20 (Mansueti)	July 20: 13. x 9.75 "	July 22-27

Groves' measurements are 13 days, and Mansueti's only one day, before hatching began, yet both clutches average lower than the first three (my own), which were measured respectively 9,12 and 9 days before the first hatching. However, at all of these intervals, further increase in the external dimensions of the eggs would be very slight. The specimens of Groves and Mansueti were taken in Cedarville State Forest, on the border between Prince George and Charles Counties, while all of mine were from St. Mary's County. Possibly locality may account for the difference in size between the two groups. At all events, a mean average of the five may yield a fairer figure for the State at large. This average, 13.7 x 10.4 mm., may be taken as the common limit of growth during incubation---beginning, as we saw above, from an average of 11.4 x 7.7 at deposit. It will be noticed that development slightly favors the shorter diameter of the egg above the longer, its tendency being toward a less elongated form as growth proceeds.

Finally, as to the time of hatching, our records cover a period of a whole month. Groves reports July 27th and August 2d-3d. Mansueti reports July 22d-27th. I have the following dates: July 10th-14th, 12th-13th, 16th (one surviving egg of a clutch, but normally developed), 20th-21st, 24th-25th, 28th-31st, August 1st-2d, 4th-6th, 7th, 10th.

The first three of my own list of hatching dates merit comment because of their earliness, as well as the peculiar situation of the three clutches. I was investigating an old stump of loblolly pine, more than two feet in diameter at the top, and so decayed that the pulp could easily be shredded apart with the fingers. Buried about 2 inches deep in the pulp of the upper surface, which had no covering from above, were three females, all in the transitional stage of color, with clutches of 9, 8 and 8 eggs respectively, at distances of a foot or more apart, and all rather near the edge. The absence of upper covering is a very uncommon thing; so was the earliness of eggs so

far developed as these, found on June 25th, and then averaging 12.8 x 9.5 mm. They can hardly have been deposited later than June 10th, unless the peculiar location had accelerated their growth. The dates of their collective hatchings, from July 10th to 16th, are certainly in advance of the average time.

Considering all the dates recorded, and remembering that artificial incubation usually retards development by a few days, I should be inclined to place the normal period of hatching within the last ten days of July. The general character of a season and the local conditions can either promote or retard development slightly, with perhaps a week to spare in either direction. We have already estimated the period of gestation at six to seven weeks, and may now, I believe, add about five or six weeks for incubation. Twelve weeks probably covers the complete development of a new generation of Eumeces fasciatus in Maryland.

Growth and Sloughing.---We have no records of the rate of growth of the common skink during its first year or two of life. Professor Taylor, having examined many examples of five species of Eumeces (including fasciatus and laticeps), observed that the measurements from snout to vent fell into fairly defined groups, and on this basis estimated the average length in each successive year of life, as exhibited in the table on Page 67 of his work, already referred to. Where the age of specimens of these two species may appear in this paper, Taylor's estimate has been adopted. We have not nearly enough data for independent computation.

In the common skink the sloughing process may often be observed in captivity. On a few occasions I have noticed it earliest in newly hatched specimens within a few days after their emergence from the egg; and this is probably regular. In a captive adult the old slough usually breaks first at the junction of the hind legs with the body. Once it has broken, the lizard gradually removes it by friction against any rough surface. I have known the whole process completed within an hour, and have seen it extended over a week. It appears to occur about two or three times during an average season of activity. During the period of transition in the color pattern of the skink, the most perceptible gradations accompany the casting of the slough.

Enemies.---The common skink shares with other species of lizards the menace of enemies already named in connection with the swift. Groves (see the Bulletin of the Natural History Society of Maryland, Vol. XII, No. 2, p. 27) has definitely added the keeled green snake (Opheodrys aestivus) to the list of serpents which prey upon the young of both swifts and skinks. Among persecutors of the skink in particular there is reason to emphasize the black racer (Coluber constrictor). From conditions under which this snake pursues the common skink, I have several times been led to suspect either a scent or a special instinct of some sort.

Mansueti mentions a young specimen whose tail was bitten off in captivity by a box turtle (Terrapene carolina).

Tail Fracture and Regeneration.---This phenomenon is even commoner in the skinks than in other Maryland lizards, perhaps because the comparatively moderate speed of the former leaves them more exposed

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to pursuing foes. Imperfect specimens are very frequent. We have no figures to offer on the rate of growth in a regenerate tail.

Hibernation.---In captivity the common skink does not hibernate well unless provided with a considerable depth of moistened sawdust. Kept in any room heated to human needs, the lizard does indeed survive the winter, but naturally refuses all food, and is likely to fail to recover its appetite in the spring, when death will ensue after a month or so. Deep in moist sawdust or wood pulp, however, and lodged in a cool place, it remains buried until spring, and then emerges and begins to eat normally.

Hibernation in the wild state begins with the first frosts of autumn. The medium selected for protection during the winter sleep is similar to any that might be adopted during the summer as shelter from a storm. On March 28th and 29th (Bulletin, Vol. IX, No. 7, p. 60), in St. Mary's County, I found three adolescent males in what were probably the quarters they had occupied all winter. Two of them were in the pulp of decayed stumps, toward the southwest surface. The third was in similar pulp at the bottom of a hollow log, and buried about three inches deep, the surrounding pulp being then so cold that a few minutes' digging made the hands ache. All of these examples were active enough to make some speed when uncovered. Doubtless in mid-winter they would have been more torpid and sluggish.

General Remarks.---The common skink is less easily tamed than the swift, and even after some familiarity with human presence, it has its occasional moods of timidity.

THE BROAD-HEADED SKINK

Family: Scincidae,
Genus: Eumeces Wiegmann,
Species: Eumeces laticeps (Schneider)

Taxonomy.---The specific isolation of Eumeces laticeps does not yet appear to be universally accepted, although Taylor and other recognized authorities treat the form as a distinct species. We acknowledge adherence to this opinion for reasons which seem to us sufficient. It is at least certain that, within the same districts of the Coastal Plain of Maryland where Eumeces fasciatus is most abundant, its range is shared by another type of the genus Eumeces, conspicuously larger and much less numerous, though by no means rare, which demands classification as a determinate group of one rank or another. Examples are far too numerous to be explained as exceptional individuals of the common skink.

Chief Characters.---If we avoid anatomical minutiae, and neglect for the moment its larger size, the conspicuous characters of the broad-headed skink do not differ much from those of the commoner species. Their similarity in form is evident from Plate 6. This view enlarges a smaller private record made eight years ago with no view to publication, and therefore imperfect in detail, but happening to serve the purpose of comparison well enough to be reproduced here. The figures are shown at 61 per cent of their natural size. Counting

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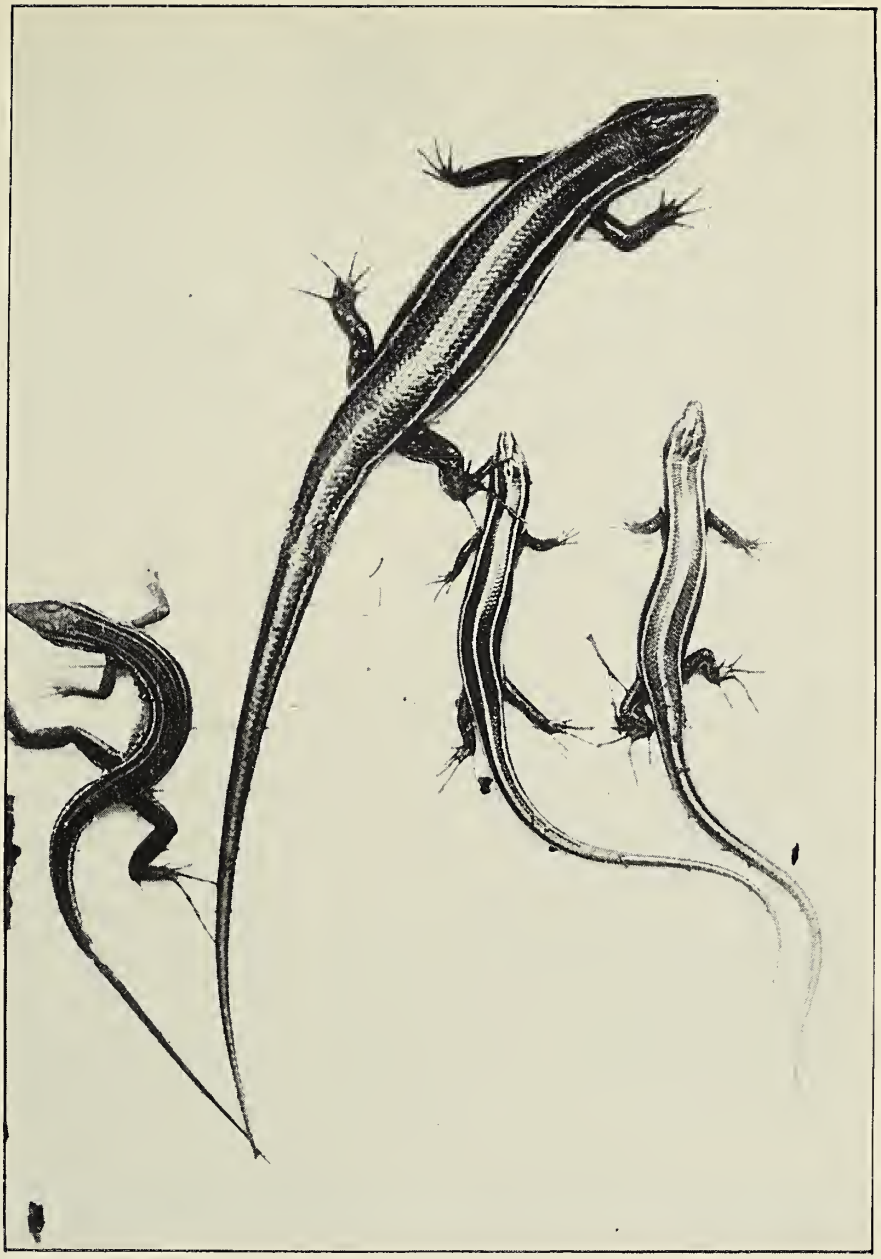

P L A T E 6

(Eumeces laticeps)

Adult female, second figure from left

61 per cent of natural size

LOWER LEFT

Six-Lined Race Runner

(Cnemidophorus sexlineatus)

LOWER RIGHT

Two Females - Common Skink

(Eumeces fasciatus)

from left to right, they are (1) the adolescent race runner already shown in Plate 3, (2) an adult female of the broad-headed skink, (3) and (4) two adolescent but mature females of the common skink, decidedly below the limit of length for that species, but both actually taken with their eggs. These two are still in color transition, with probably a year's difference between their ages. All of the skinks in this view are perfect examples. The narrow band of interrupted scalation on the tail of the largest figure, nearly an inch below the thighs, was not a mark of earlier fracture and regeneration, but the scar of a skin wound which had not impaired the structure of the tail.

Comparing the latter figure with its two smaller neighbors to the right, it will be seen that the broad-headed skink, even of the female sex, has a skull wider at the ears than the common skink, and a body proportionately wider in greatest diameter. None of these three females contained eggs when photographed. Apart from this slight difference in proportion, the structure of the two forms is closely similar.

Size.---Some of our latest specimens have been accurately measured, and their dimensions are quite typical.

	Snout to Vent	Tail, original	Tail, regenerate
Old Male	115 mm.	25 mm.	73 mm.
" "	113 "	46 "	62 "
Adult Male	98 "	142 "	20 "
Adolescent Male	93 "	16 "	79 "
Adolescent Female	92 "	143 "	-----

Only the last of these was a perfect specimen, though the third also was practically so.

Four perfect specimens taken in earlier years were measured in inches, but only in terms of their total length. Their records are as follows:

Adult Female	10-3/4 inches	(approx. 270 mm.)	entire
" "	10-1/2 "	(" 265 ")	"
" Male	10-1/4 "	(" 260 ")	"
" "	10 "	(" 255 ")	"

With only total length to go upon, it would be inconclusive to estimate the length of any of these four from snout to vent in millimeters, except to show that, like the five examples in the first table, they belong to a type of skink from which the common species must be excluded. A gauge sufficient for this purpose may be formed by applying the ratio of snout-to-vent to total length in two of the examples in the first table, namely, the perfect female fifth in the list, whose ratio is 39 per cent, and the almost perfect male in the third place, whose ratio is 37 per cent. Applying this last as a lower limit, the last and shortest specimen mentioned in the second table would measure 94 mm. from snout to vent, and could not have measured less than 90. On the other hand, Taylor places the maximum length of the common skink (Eumeces fasciatus) at 80 mm. from snout to vent (pp. 84, 91); and the longest example in our records did not

exceed 78 mm.

To return to the first of the above tables, the exceptional length of the first two examples may justify a word in verification of the figures. The first example, taken in St. Mary's County, near the Glebe School of old St. Andrew's parish, was measured after being etherized and before preservation, on November 29th. On the preceding June 14th it had been measured at the Society's headquarters, by Mr. Maugans, myself and several others, when its length from snout to vent had been 113 mm. On that same occasion the specimen mentioned second in the table, and taken at Indian Landing, Anne Arundel County, was measured by the same group of observers, when the perfect coincidence of the two specimens in every figure (including even the dimensions of the head) prompted us to take a second measurement as a check on the first. The subsequent growth of the first example to 115 mm. between June 14th and November 29th was due to abundant feeding in captivity, and may represent a rate of increase not likely to have been attained in freedom. At all events, the accuracy of the figures is well attested; and, since the two specimens came from localities fully fifty miles apart, such measurements seem to indicate that conditions in Maryland favor the development of the broad-headed skink to proportions fully comparable to any yet reported from other regions.

Color.---The successive color patterns of the common skink already described above are repeated almost exactly in the broad-headed skink, and presumably at about the same year of life in both alike, though attaching to different scales of size. In point of color, however, the broad-headed skink during its early years has one distinctive character, so far as our experience of Maryland examples goes. The body bears not only the five longitudinal stripes of yellow on a ground of black, but also a well defined "sublateral" line low on each side, making seven lines in all. Plate 9 displays this character in a young specimen, here magnified to twice its natural size. The sublateral is dull white in color; above it, to the lateral, is the regular black ground-color, while below it a dark gray area from one to two scales in width shades gradually into the pale abdomen. In the preserved specimen which is photographed here, the sublateral is visible on about a dozen scales anterior to the forelimb, and can be traced for about twice that distance posterior to the vent before merging into the subcaudal blue, whereas it is most distinct between the fore and hind limbs.

Individual examples of the broad-headed skink, as also of the common skink, exhibit slight variations in color during the period of transition, so that the exact year of age cannot be judged from the pattern. For instance, I have found a female with six eggs (very probably her first), yet with the black body and blue tail of the juvenile scheme quite unmodified; and have had another captive female in which transition was well under way, but which proved to be sexually immature. The steps of progress from the first to the last coloration are fairly uniform, here as in the common skink, but they do not always accompany exactly the same year of life. They rather conform to size than to age; and size depends to a great extent on relative abundance of food. The second and immature specimen mentioned just above had fed abundantly and grown rapidly during several months of captive life.

Distribution.---We can record the broad-headed skink from the following localities.

Anne Arundel County: Mansueti reports one specimen taken at Lake Shore by Clyde Reed; one at Indian Landing, by August Selckman; one at Arnold, near the Magothy River, by Milton Oler and Richard Stearns. All of these are preserved. One taken at Camp Linstead by John Norman is alive in captivity.

Calvert County: one observed by Mansueti at Cove Point.

St. Mary's County: I have taken two specimens near Leonardtown; one near the Glebe School of old St. Andrew's parish; one at Ridge; one at Dameron; also taken two and observed three others near Beachville, where J. Curry and R. Zegers, S. J., also secured an adult female, and the last named brought it successfully through a winter in captivity.

Environment.---The natural conditions under which this species pursues its life are precisely those already described for the common skink, excepting only that the broad-headed skink, being so much larger, finds fewer serviceable shelters than its smaller relative, and therefore clings rather tenaciously to a good home once established. The first specimen that I ever captured cost me four visits, on different days, to the same tree, where it was too much at home to seek another refuge even from such persistent disturbance.

In severely warm weather a few hours of sunning in the morning and a few more in the evening are sufficient for its needs, and at high noon it may be uncovered under shelter, even at some distance above ground. It seems, on the whole, to be slightly more arboreal in habits than the common skink, though here again the females are rather partial to terrestrial shelters for the incubation of their eggs.

Captive specimens must have water rather frequently, and may not be long exposed to high temperatures. Conditions in which the swift would thrive may easily be fatal to the broad-headed skink. On the other hand, moderate moisture is the requisite rather than really wet surroundings. A fine pair of adults were lost during indoor hibernation because the surrounding sawdust became too sodden with water.

General Conduct and Disposition.---Like the common skink, this lizard is shy and evasive, and bites hard to free itself from handling In captivity it becomes somewhat accustomed to a human keeper, though always resentful of contact with the hand. Measuring a living specimen usually puts it in a fright for several days. However, if left untouched and otherwise comfortable, it learns to expect food and drink from a customary source, and may retain such memories after long interruption. An adolescent male now in captivity passed a winter indoors, eating nothing from late in October until the following March 19th. That day being mild, the skink, seeing me approach the cage, came towards me with its head raised, expecting to be fed as it had been five months before. Nevertheless, I have never known one to become really tame.

Food.---The great variety of insects already included in the diet

of the common skink may be repeated for that of the present species also. In addition, it is reported to break the shells of small eggs and to lap their contents, though we have no experience of this practice. There is also reason to suspect it of occasionally preying upon smaller lizards. Mansueti reports a large captive specimen from Georgia as discovered in the act of devouring a race runner which it had killed, though it abandoned the meal when disturbed. Undoubtedly any lizard which the broad-headed skink might swallow would have to be very much smaller than its captor.

When food happens to be abundant, this lizard can eat a surprising quantity at a time, just as under opposite conditions it can fast for long periods, probably drawing on surplus nourishment already stored in the tail. I once experimented with an adult female, measuring 10-3/4 inches entire, expecting to sound the limit of her appetite, but after she had eaten thirty mealworms on a single occasion I decided that the laurels should be hers.

My own captive specimens always became choice in their diet during the early autumn, beginning to refuse the familiar mealworms. At this period (during September and early October) they would eagerly seize much larger larvae brought fresh from the woods, and devour them piecemeal after shaking them apart; but their favorite food at this time was crickets, which they never refused until the early frosts banished their appetite altogether. This, after all, was but showing preference for the commonest diet of the season.

Reproduction.---As to breeding in the broad-headed skink, none of us have had opportunity to witness it. On the time when eggs are deposited, also, our records are but sparse. In 1933 I found one female with 6 eggs, under rather peculiar conditions. An immense white oak log at the edge of heavy timber had on its upper surface a broad channel of soft black pulp confined at the sides by thick and hard wood. At a spot about 3 inches deep in the pulp, but unprotected from above, the female was disturbed, and escaped capture. Her eggs were then discovered in the pulp, not collected, but scattered a few inches apart. They had a very fresh appearance, and it is possible that the lizard had not finished laying when disturbed. The date was June 30th. On the other hand, since her juvenile colors were still unmodified and her tail of the purest blue, this was probably her first brood, in which case the small number of the eggs would be about normal. About a week later I saw her on the same log, and again failed to capture her, but robbed her of a large portion of her tail. At the time I did not know her species, and was puzzled to account for a fragment of tail still blue and yet all of four inches long, and thus detached from a lizard at least eight inches in total length, whereas every mature female of the common skink which I had ever seen had lost the last remnant of the juvenile blue before attaining a length of 6-1/2 inches, or 7 at the most.

These eggs were fertile, and I may add that they hatched quite normally on August 11th, just 6 weeks after their discovery. At that time I knew nothing of the existence of Eumeces laticeps as a distinct form, and released the young without a second look. Nor have I any record of the measurement of the eggs.

Again with regard to the date of deposit, a large adult female, taken on May 12th, 1939, was kept in captivity through the summer. Her

proportions seemed to indicate that she was gravid. She fed copiously until about June 29th, and then lost appetite. On July 9th and 10th she deposited 11 eggs, all unfertile. From her conduct I could not gather much with regard to the broad-headed skink's treatment of its eggs. The floor of her cage was covered with moist pulp to a depth of an inch, and a strip of bark provided for shelter. Under this bark I found, at 9 a.m. on July 9th, that the lizard had cleared the floor in a circle about two inches in diameter, having pushed the pulp into a surrounding wall to the height of the bark, and had deposited 5 eggs within it. I left all undisturbed until noon, when I found all the pulp so replaced as to cover the 5 eggs in a group, and 2 others separate. The next day, July 10th, I found 4 more eggs scattered about in the pulp some distance from the original group. The mother showed no disposition to guard them. Her instinct may have made her somehow indisposed to care for unfertile eggs. These eggs averaged 12 x 7 millimeters at deposit. Being unfertile, they soon corrupted.

Incubation.---Although we have hitherto discovered only one mother of this species with her eggs, it is commonly affirmed that the female remains with her eggs during their development, as in case of the common skink. That the unfertile specimen mentioned just above made no attempt to do so, may have been due to an instinctive sense that the eggs were worthless and only a burden to be rid of.

Hatching.---The only instance we have on record has already been mentioned (under "reproduction" above) as involving 6 weeks between the date of hatching and that of the discovery of the eggs, apparently then quite recently deposited. Presumably, in the broad-headed skink the periods of gestation, incubation and hatching are about the same as those already stated for the common skink. We have no exact data here.

Growth and Sloughing.---It is a commonplace that any reptile's rate of growth is in direct ratio to the relative abundance of its food-supply. As it is easy to feed a captive lizard to its utmost capacity, and so to promote rapid growth, the consequent frequency of sloughing may be much increased in captivity. Making this allowance, I find that four specimens of the broad-headed skink (two adult, two adolescent) averaged one slough to every quarter inch of growth. One of these sloughed twice, one three times, and two four times within one season of captivity.

Enemies.---These do not appear to differ from those of lizards generally, as enumerated above, especially in connection with the common skink.

Tail Fracture and Regeneration.---This phenomenon is very common in the broad-headed skink, as in its smaller relative. In the present species some figures are available on the rate at which regeneration proceeds, at least for a limited period. An adolescent male was measured twice, with the following results:

	Snout to Vent	Tail, original	Tail, regenerate
Sept. 18th, 1941	87 mm.	16 mm.	75 mm.
May 18th, 1942	93 "	16 "	79 "

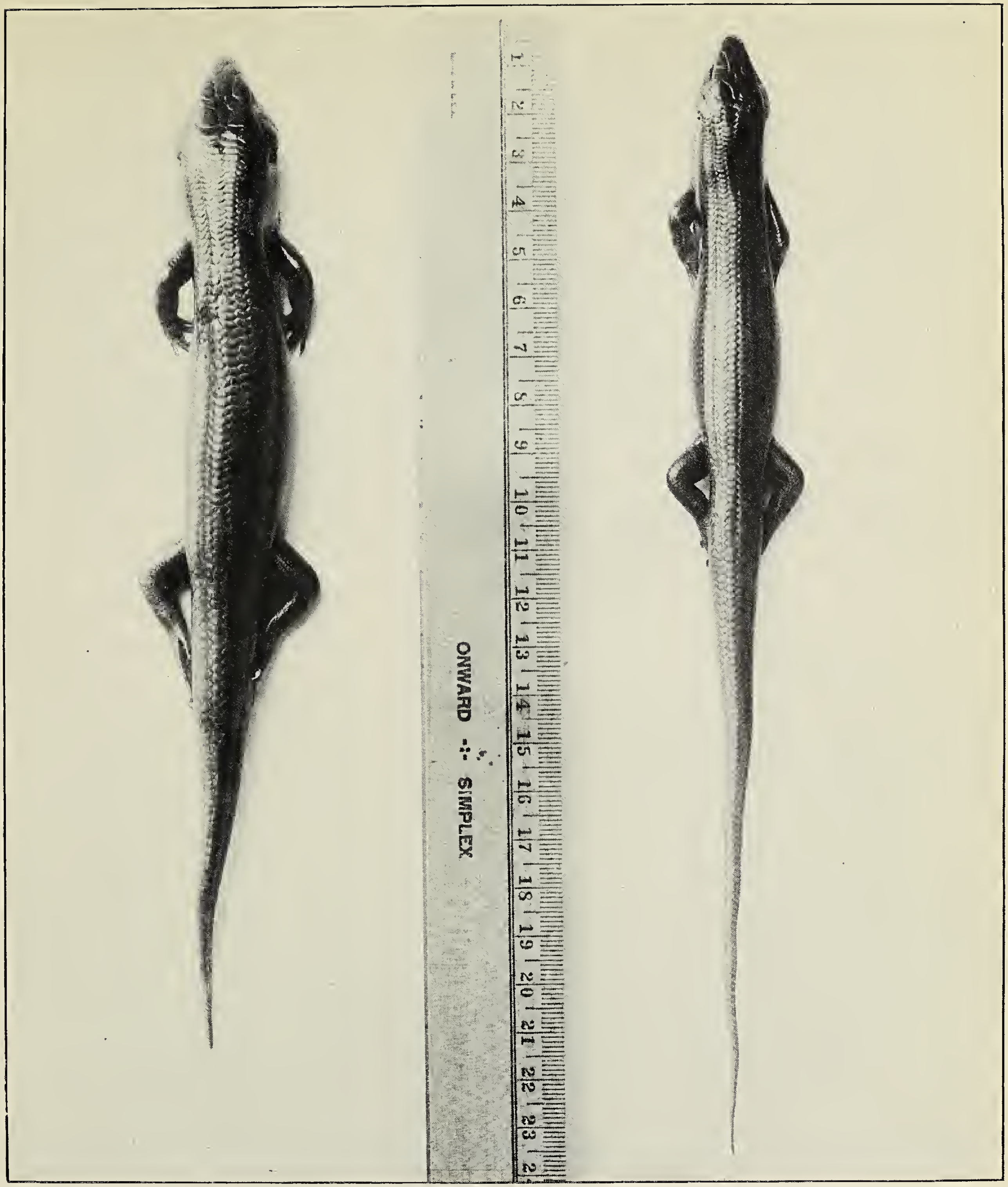

PLATE 7

THE BROAD-HEADED SKINK (Eumeces laticeps)

Left: Old Male, tail twice regenerate

Right: Immature Female, perfect

Dorsal aspect

80 per cent of natural size

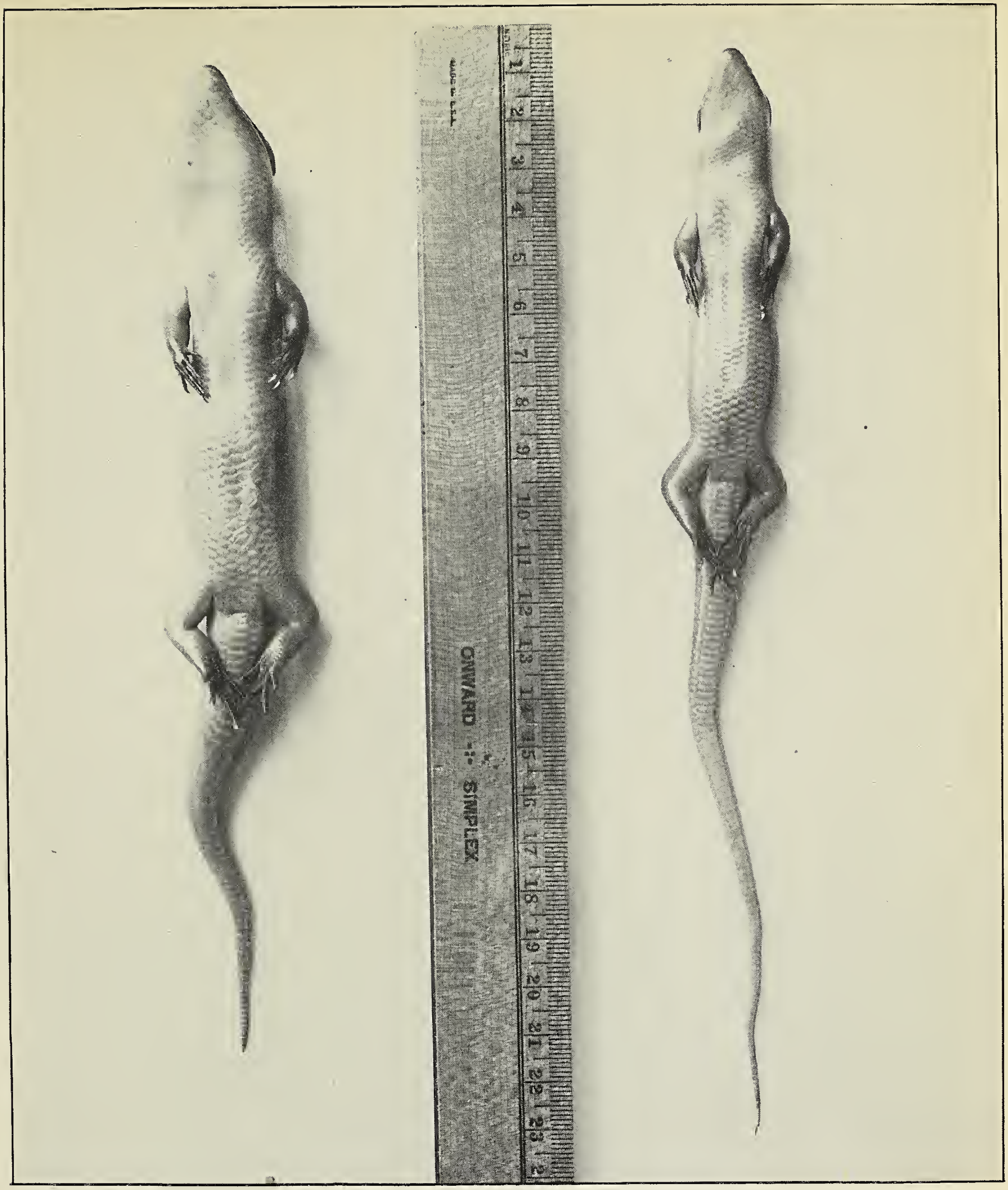

PLATE 8

THE BROAD-HEADED SKINK (*Eumeces laticeps*)

Ventral aspect of Plate 7

80 per cent of natural size

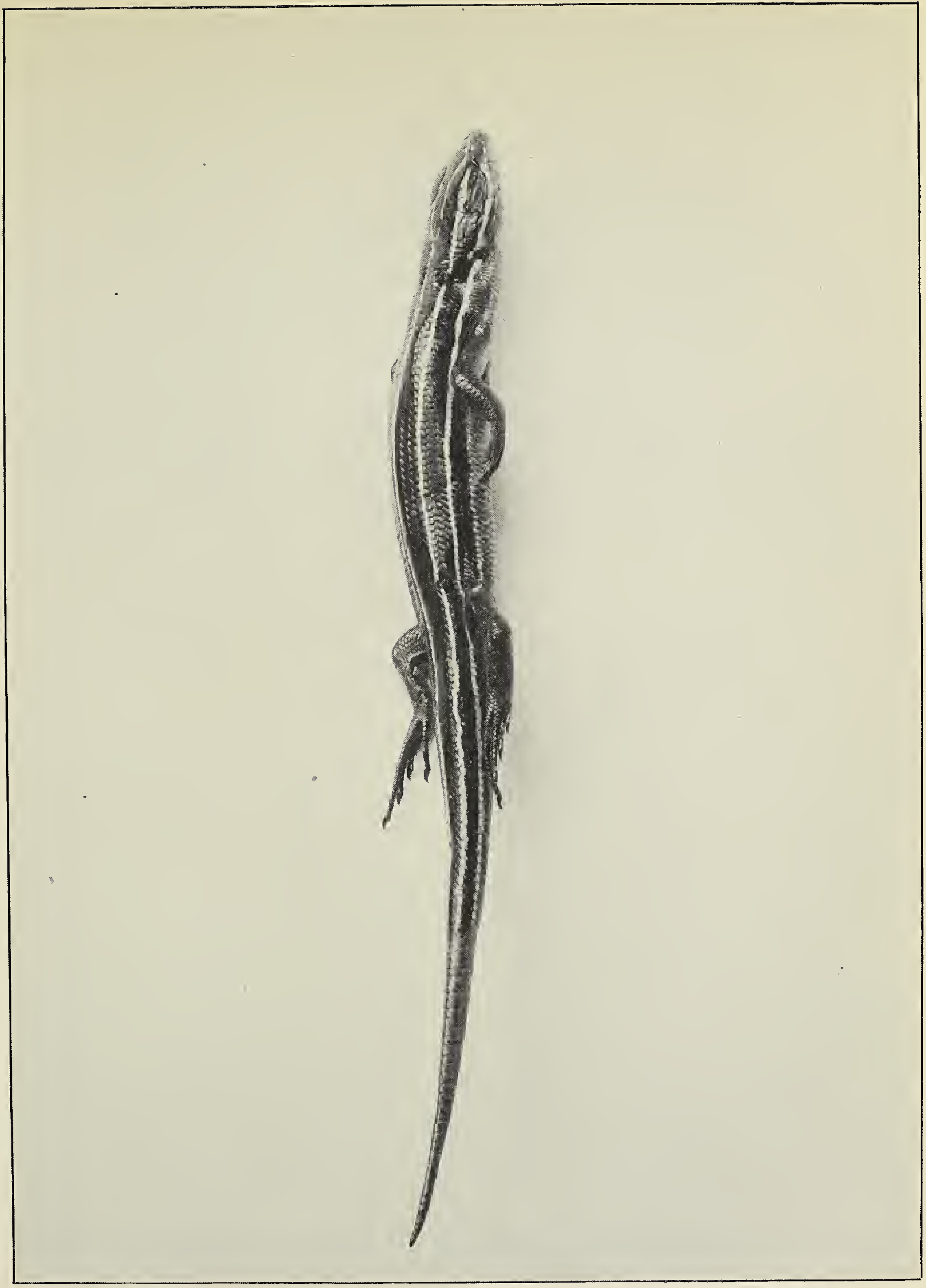

PLATE 9

THE BROAD-HEADED SKINK (Eumeces laticeps)

Young specimen, twice natural size, showing sublateral line

This, it is true, is only a single instance; but so far as it goes, it reveals no increase in the original part of the tail in one month of feeding before hibernation, five months of hibernation, and two months of feeding thereafter; while in the same period the regeneration has progressed 4 mm., and the length of the body from snout to vent, in spite of its greater bulk, has advanced 6 mm. After all, one might expect the chief parts of the anatomy to enjoy priority in the distribution of newly acquired tissue. After fracture of the tail, I doubt whether the original portion increases at all in length until the regenerate portion has about reached its own limit of increase,---unless the portion lost has been comparatively small.

Hibernation.---There is nothing to add to what has been said of hibernation in the case of the common skink.

General Remarks.---Much remains to be known more exactly of Eumeces laticeps, although a good deal is already ascertained. Being less common than E. fasciatus, although more conspicuous for its size than any other Maryland species, it merits the close attention of herpetologists whose opportunities may lie in heavily timbered sections of the Coastal Plain. Male examples, especially in midsummer and thereafter, may often be espied well up the trunks of trees, where the collector would not think of looking for any other lizard. By a little maneuvering the skink may sometimes be frightened from above into coming down within closer reach, and thus captured with a fine noose of pack-thread. The female, in particular, and her eggs are in want of more abundant and accurate observation than our opportunities have yet made possible. The species feeds well in captivity, and is altogether a satisfactory subject for study in life. With the beginnings already made, it is hoped that the near future may supply much information that is still to seek.

ON THE SPECIFIC ISOLATION OF EUMECES LATICEPS

It seems fitting, in conclusion, to sum up the arguments which convince me that Eumeces laticeps is a distinct species of its genus.

Relation of size to color.---With the exception of the minor variations already noted in the transition of individual examples from the earliest to the latest color-scheme, I have found the successive stages to correspond exactly with those of E. fasciatus, and yet to be repeated in a different scale of dimension. One thing I regard as certain from the observation of many specimens: at a length of 7 inches entire, the common skink never retains the slightest remnant of the juvenile blue, even in the form of bluish gray.

On the other hand, I have observed one female skink (with 6 newly deposited eggs) in which the black body, yellow lines and pure blue tail of the juvenile color were unmodified and conspicuous at sight. While I could not measure her, she cannot (as already stated above) have been less than 8 inches in total length, and would therefore be 9 inches or more in total length before all traces of blue could be lost.

A still more striking instance is that of another female now in

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preservation. She also was of the juvenile pattern when taken on May 11th. On June 14th, with the assistance of Mr. George Maugans and some other members of the Society, her measurements were found to be 86 mm. from snout to vent, and 220 mm. (8-9/16 inches) entire. Her sublateral stripe, though faint, was still evident. Not only was her tail a decided blue, but it still retained a duller blue on August 2d, when a second measurement showed her to be 92 mm. from snout to vent and 235 mm. (9-1/4 inches) in total. Furthermore, she had been confined in the same cage with an old male from May 11th, yet no breeding took place between them, nor any evidence of appetite on the part of either, and no unfertile eggs were laid. She was clearly not mature.

The sublateral line (which has now disappeared) was diagnostic in any case. But a skink blue-tailed and also sexually immature at a length of nine inches can hardly be explained as an aberrant individual of *Eumeces fasciatus*.

The size itself is not without significance when we find the same *set of larger proportions* repeated in a fair number of examples, including both sexes. Enough has been said above on this subject.

Size of eggs at deposit.---Professor McCauley (*Copeia*, 1939, No. 2, July 12, pp. 93-95) records a number of measurements of eggs of *Eumeces laticeps* at the time of *deposit*. He presents an abundance of *data both interesting* and *pertinent to* the present question, which our readers may find well worth consulting. From them I would borrow two sets of measurements for eggs of *Eumeces laticeps* at time of deposit---the only ones given for the *species in his article*. Ten eggs laid July 12th, and measured by McCauley, averaged 14.7 x 9.7 mm. Another clutch reported by him from measurements of Noble and Mason showed an average of 15 to 18.5 x 9 mm. at deposit. With these figures I would compare our own findings of the dimensions of eggs of *E. fasciatus* at deposit, as already recorded above: 12 x 7.2 mm., 10.75 x 7.5 mm., 11.48 x 7.97 mm., 11.24 x 8.13 mm. Not only the mean average of these four clutches (11.37 x 7.7 mm.), but the highest average of any one of them, will at once be seen to fall definitely below the dimensions given for *E. laticeps*.

Interbreeding doubtful.---A word is due to the adult female *E. laticeps* *mentioned above as* having laid 11 unfertile eggs on July 9th and 10th. She was taken on May 12th, in a district where the common skink (*E. fasciatus*) was so abundant that I had taken 5 specimens before uncovering the *laticeps*, the last of them about a yard away from her in the same log. And yet she was unfertile as late as May 12th. Of course, one cannot be certain that she ought to have been fertile by that date if interbreeding between the two forms were possible. However, it borrows probability from the dates given above for the breeding of the common skink in captivity, which range from May 7th to 31st, and this in Baltimore County, where the season is at least two weeks later than in St. Mary's County.

It seems to me that this cumulative evidence, if not conclusive, strongly tends to support the opinion that the broad-headed skink is really a distinct species.

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THE NATURAL HISTORY SOCIETY OF MARYLAND

PROCEEDING NO. 9

SOME INDIAN VILLAGE SITES OF TIDEWATER MARYLAND

BY

RICHARD E. STEARNS

CURATOR, DEPARTMENT OF ARCHAEOLOGY

BALTIMORE, MARYLAND
JULY, 1943

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PREFACE

This proceeding is a resume' of twenty-five years archaeological research in Tidewater Maryland, the most intensive effort being in the last fifteen years during which time a considerable collection of Indian artifacts has been accumulated. The artifacts of each village site have been kept together, so as to make comparison and study simple.

Many of these artifacts were found on the surface, in cultivated fields and on river banks subject to erosion by the waters of the Chesapeake Bay and its tributaries. Also various sites were excavated, from which many fine specimens were taken.

It is deemed necessary to explain some of the terms herein used in the description of pottery.

The term "basketry impressed" is used to describe the surface impressions on such sherds as those shown in Plate X b, Plate XII, No. 10, and Plate XVIII, Nos. 1, 5, 10 and 15. The writer is not certain that these impressions are actually those of basketry, but as some descriptive term is necessary, the word basketry will suit this purpose until such time as we are able to discover the true nature of the material used.

"Cord impressed" and "fabric impressed" are terms used in describing surface impressions applied with a paddle wrapped with cords or covered with a piece of woven fabric or net. Typical examples of sherds so impressed with cords are shown in Plate XV, No. 1 and Plate XIV; those impressed with fabric, Plate VIII Nos. 6 and 15, and with net, Plate XIII No. 15.

"Beach ~~and~~ sand tempering" consists of sand which has the appearance of having been gathered from the beach. The grains of sand vary in size from minute particles to small pebbles one-eighth of an inch in diameter. Sherds containing this form of tempering material have a rough surface and are nearly always " cord impressed" and are never decorated. Typical examples are shown in Plate XVI, Nos. 1, 2, 4, and 7.

"Crushed quartz tempering" consists of large pieces of quartz which have been crushed to the size desired for use as a tempering agent.

Oyster shell was likewise used when crushed into small pieces.

I wish to express my appreciation of the aid received and work done by Mr. T. Milton Oler, Jr. along the Magothy River; to Mr. Woodward Burkhart for his work along the Magothy River and Little Round Bay, and Conowingo; to Mr. Paul Hurlock at Booby Bar Site; to the members of the Society for many courtesies; and to Mr. James Marks of Love Point who extended me the privilege of photographing his specimens from Kent Island; and last but not least to my wife, who accompanied me on most of my trips and aided me in all my efforts.

JAN 17 '44

R.E.S.

INTRODUCTION

It is very evident that our fast encroaching civilization is gradually obliterating and effacing the Indian Village Sites along the Chesapeake Bay tidewater regions of Maryland. For twenty-five years Mr. Richard E. Stearns has been making a systematic study of these sites and their contents with the idea of throwing light upon the lives, manners and customs of the aborigines of this State.

With this in mind, and the conditions imposed on us by the War, which naturally divert efforts of this sort, Mr. Stearns thought it advisable to publish the results of what has already been accomplished.

Up to the present time very little has been published on the archaeology of the Upper Chesapeake Bay Region. This publication, "Some Indian Village Sites of Tidewater Maryland", should be a welcome addition to this scanty supply of literature and an incentive to others to add to the knowledge of these already worked sites, as well as to discover new ones which no doubt exist, but which have been overlooked so far.

Mr. Stearns, who is Curator of Archaeology of this Society has published numerous articles in the Society's Bulletin on various phases and sites of Maryland Archaeology, and recently published Transaction No. 6, on "The Hughes Site, An Aboriginal Village Site on the Potomac River in Montgomery County, Maryland". These publications should be a stimulant for others to continue the work Mr. Stearns has so ably begun.

Edmund B. Fladung, President

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It is [illegible]

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[illegible] Director of [illegible]

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I THE BOOBY BAR SITE

This site is located at Booby Bar in Baltimore County, on the lands of Mr. Jerome Tauroza. The principal features of the site consist of several shell heaps extending from Booby Bar for a distance of about one half mile westward. The map (Fig. 1) and plan (Fig.2) show the location of the site and extent of the shell deposits. The heaviest shell deposit is situated at the head of the small creek marked "E" on the plan, (Fig. 2) and extends for a distance of approximately one hundred yards from the creek bank to Mr. Tauroza's house.

A few years ago Mr. Tauroza began to dig shell from the eastern side of this deposit for use in repairing roads. During this work he encountered several fire places and pits, one in particular containing ashes and a quantity of sherds and animal bones. Mr. Tauroza kindly granted us permission to do some work of our own, whereupon we dug a strip ten feet wide along the edge of his excavation. We encountered three small pits, one containing nothing but shell and the others some shell, ashes, bones and sherds. These last two probably were fire places. The depth of this deposit averaged about two and one-half feet in Mr. Tauroza's excavation and two feet in the strip that we dug. From this point westward toward the road the shells gradually thinned out to a few inches. Sherds, arrowpoints, hammerstones, pitted stones and a great number of pebbles and fire-cracked rocks were encountered throughout the excavated areas and on the surface. The upper twelve inches of the deposit was so densely packed with shell that of late Mr. Tauroza had ceased cultivation in this part of his farm.

A study of the artifacts that were recovered through excavation showed that the same types occurred at all depths in the deposit. Mr. Tauroza's excavation is shown in the plan of the site (Fig. 2) by the letter "A" and ours by the letter "B".

Shell deposit "C" has been in grass for some years and we were unable to collect anything from it.

Deposit "D", however, has been continuously under cultivation and we were able to gather a small collection from the surface.

Two views of the site are shown in Plate I. The upper view (a) shows the principal shell deposit lying between Mr. Tauroza's house, at the left, and the woods at the head of creek "E" which is located at the right of the picture. The arrow points to a chicken house, which is shown again in the lower view (b). This view shows the beginning of our work alongside of the excavation previously made by Mr. Tauroza.

CERAMICS

Through excavation and surface collecting some five hundred sherds were obtained, representing about thirty vessels. Except for a scant dozen, these sherds were all of one type, typical examples being illustrated in Plate II, Numbers 9 to 25. These sherds show that the vessels were of good size and made of clay ranging in color from buff to dark reddish-brown. The average thickness of side wall sherds is seven-sixteenths of an inch, and near the base somewhat thicker. Rim sherds show an abrupt thinning to one-quarter inch or less. Tempering

[illegible]

[illegible] site is located [illegible] County, [illegible] shell [illegible] deposit [illegible]

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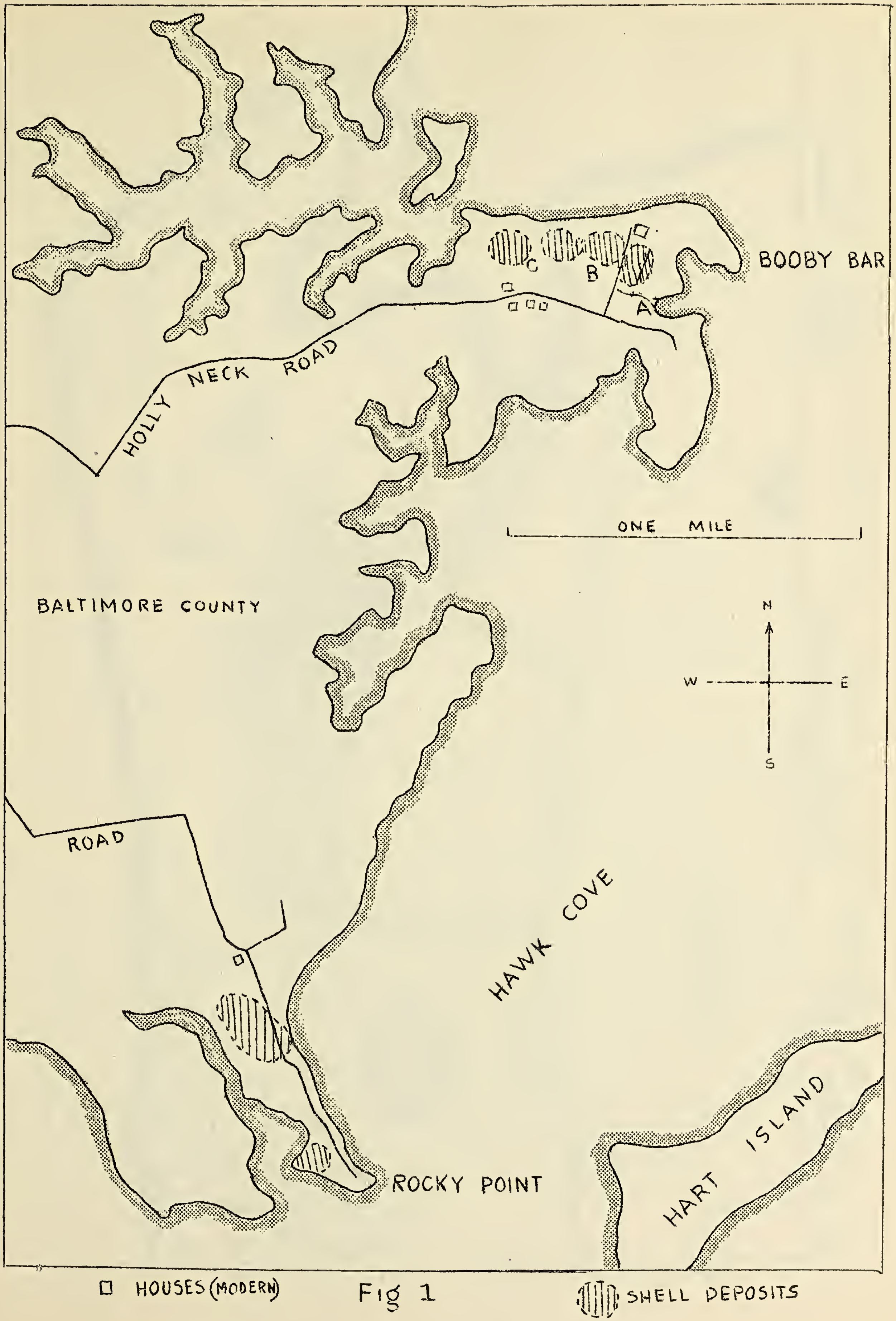
BOOBY BAR
C
B
A
HOLLY NECK ROAD
ONE MILE
N
W
E
S
BALTIMORE COUNTY
ROAD
HAWK COVE
ROCKY POINT
HART ISLAND
☐ HOUSES (MODERN)
SHELL DEPOSITS

Fig 1

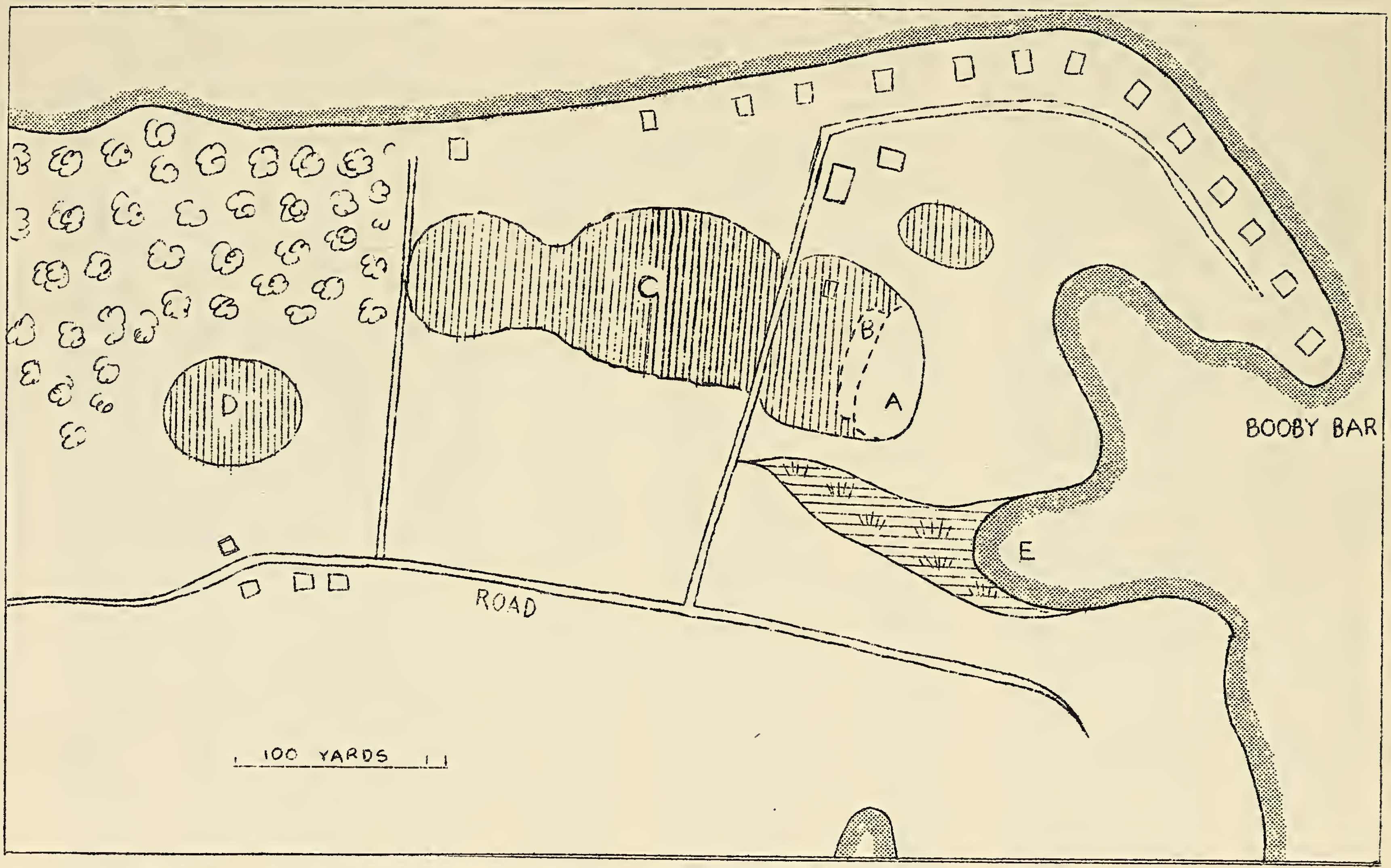

Fig. 2 BOOBY BAR □ HOUSES (MODERN) ▥ SHELL DEPOSITS
A - AREA EXCAVATED BY MR. TAUROZA B - EXCAVATED BY NATURAL HISTORY SOCIETY

material consists of particles of oyster shell or crushed quartz, although shell was used to a greater extent. The exteriors of the vessels were impressed with coarse fabrics, in some cases resembling nets. No other form of decoration was used on the vessels except for notches applied to the interior surface at the rim. Only two rim sherds bore such notches; these are shown in Plate II, Numbers 21-22.

The few exceptional sherds recovered that did not conform to the previously described type of ware are illustrated in Plate II by Numbers 1 to 8. Numbers 1 to 5 and 7 and 8 are sherds of a single type, representing at least three vessels. In thickness they never exceed one-quarter inch; the color is dark reddish-brown and the tempering material is fine crushed quartz and sand. The exterior impressions are those of fine cords. Numbers 2, 3 and 5 are sherds from near the rim of the vessel and show impressed decoration of cords and cord wrapped stick.

Number 6 is a small sherd one-quarter inch thick, tempered with shell and bearing faint impressions resembling basketry, which unfortunately did not register on this photograph. The sherd is further embellished with an incised decoration.

This was the only sherd of this type found at the site. It was not recovered from the main shell deposit, but from the surface of the one marked "D" on the plan (Fig. 2) in association with sherds and arrowpoints similar to those from the rest of the site. This type of ware was used to the almost complete exclusion of other forms at the site located on Little Round Bay Creek, one of the other sites described in this paper.

It was found impossible to make even a partial restoration of a vessel, consequently no illustrations of shapes can be shown from this site.

STONE ARTIFACTS

About seventy-five stone implements were recovered, nearly all from the surface and consisting principally of arrowpoints. These are shown in Plate III. The arrowpoints illustrated are a little less than half the total, which includes some broken ones. Numbers 7 and 8 are made of grey flint. Those in the lower panel are made of quartz and the remainder are of rhyolite. Number 10 was the only triangular point found and number 9 the only one with a fish tail base.

Numbers 1, 2, and 3 are pitted hammerstones; number 6, a celt; number 4, a broken gorget of mottled fine-grained grey slate.

Number 5 is a bannerstone wing made of dark grey slate and has two holes bored through the base of the wing, probably for repair. The celt, gorget and bannerstone were found on the surface by Mr. Tauroza.

The writer also found on the surface a fragment of a thick black slate two hole gorget.

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II THE ROCKY POINT SITE

Rocky Point is situated two and three-quarter miles in a southerly direction from Booby Bar. About five hundred yards north of the point there is a shell deposit covering several acres, having a maximum dimension northwest and southeast of two hundred yards.

Two views of this site are shown in Plate IV, the upper one (a), photographed in 1933, shows the field containing the shell deposit while it was still under cultivation. View (b) shows the field six years later in 1939. The site is now a summer resort and at present there are more houses than appear on the plate.

There is a shell deposit of undetermined extent right at Rocky Point, which we could not investigate, as it has been in grass for some years, and is also partly covered by houses. It does not seem to be as large as the one further north.

We did not excavate this site, and consequently our collection is entirely from the surface. Stone objects number eighty-five specimens, but the sherd collection is not very large, about three dozen pieces in all. They are reduced in size and somewhat weathered through cultivation, but it is still possible to classify them.

Plate V shows those that were fit to illustrate. Fabric impressions on the exteriors were the general rule, though several sherds bore the marks of cords. At this site either shell or crushed quartz was used for tempering, about in equal proportions. Only a few sherds will be described in detail.

Plate V, Number 21 is a sherd similar in all details to some from Booby Bar illustrated in Plate II, Numbers 1 and 4.

Plate V, Number 15 is of the same type of ware as the specimen found at Booby Bar shown in Plate II, Number 6. It is shell tempered and as it is from the lower part of a vessel it shows no decoration, but does exhibit very plainly the basketry-like impressions which did not photograph well on the Booby Bar specimen.

Plate V, Number 23 illustrated two sherds that fit together. These were photographed in this manner to show the width of the coils.

STONE ARTIFACTS

Four celts are shown in Plate V, Numbers 1 to 4. Number 1 is broken and is made of brown sandstone. Numbers 2, 3 and 4 are made of a fine grained compact trap rock, the usual material for axes and celts in Tidewater Maryland.

Number 5 is an abrading or anvil stone made of trap rock. Numbers 6 and 8 are pitted sandstone hammerstones and Number 7 is a spherical hammerstone of quartz.

Two fragments of grooved axes were found; one made of trap rock was from a rather large axe; the other, which was much smaller, was made of a stone (porphory) resembling a fine-grained granite. Both these fragments contained parts of the grooves and are mentioned as

[illegible] 11

[illegible] to [illegible] we went [illegible] miles up a [illegible]ly direction from Booby [illegible]. About five hundred yards south of the point there is a small deposit covering several acres, [illegible] and some part of two hundred yards.

Two views of this site are shown in Plate [illegible], the upper one (a), photographed in 1935, shows the field containing the shell deposit when it was still under cultivation. View (b) shows the same area taken in 1939. The site is now a summer resort and at present there are more houses than appear on the plate.

There is a small deposit of [illegible] cannot [illegible] point, which we could not investigate, as it has been in grass for some years, and is also partly covered by houses. It does not seem to be as large as the one further north.

We did not excavate this site, and consequently our collection is entirely from the surface. Stone objects number eighty-[illegible] specimens, but the sherd collection is not very large, about [illegible] specimens in all. They are reduced in size and [illegible] through cultivation, but it is still possible to classify them.

Plate [illegible] shows sherds that were cut to illustrate. [illegible] on the exteriors were the [illegible] marks, though several among them [illegible] of cords. At this site either [illegible] about in equal proportion. Only a few will be described in detail.

Plate [illegible], number [illegible] is a sherd similar to [illegible] have been illustrated in Plate [illegible], numbers 3 and 4.

Plate [illegible], number [illegible] is of the same type of ware as the [illegible] shown in Plate [illegible], number [illegible]. It is about [illegible] and as it is from the lower part of a vessel it seems to [illegible] very plainly the basketry-like impressions which [illegible] fragment [illegible] under the [illegible].

Plate [illegible], number [illegible] illustrates the [illegible] photographed [illegible] to show the [illegible].

Stone Objects

Stone [illegible] are shown in Plate [illegible], numbers 1 to [illegible]. Number 1 is broken and is made of [illegible]. Numbers 2, 3 and 4 are made of a fine grained [illegible] rock, the usual material for [illegible] in [illegible] Maryland.

Number 5 is an [illegible] made of [illegible]. Numbers 6 and 8 are pitted [illegible] and Number 7 is a [illegible].

Two fragments of grooved axes were found; one [illegible] made of a stone (porphyry?) resembling a fine-grained granite. [illegible] fragments [illegible] of the groove [illegible].

showing evidence that grooved axes were used at this site.

Arrowpoint types are shown in Plate VI. Those in the lower panel are made of quartz. Number 1 is a blade of quartzite. Numbers 3 to 9 are made of cherty materials, including dark-brownish grey flint, brown jasper and green jasper. The remainder are all made of rhyolite.

A few additional stone objects are shown in Plate IV. Number 1 is a broken unfinished sandstone gorget and Number 2, a piece of black slate notched at both ends. Number 3 shows two views of a stone pipe, badly broken, made of a light-blue grey compact stone, flecked with lighter particles. Pipes, either of stone or clay are not very common in Tidewater Maryland, and this specimen is the most complete of the several fragmentary stone pipes found by the writer.

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III FORT SMALLWOOD SITE

This site is located on Rock Point at the mouth of Rock Creek in Anne Arundel County. The area occupied by the site is about equally divided between Fort Smallwood Park on the north and the property of Mr. R. J. Cremen of Baltimore on the south.

All this land was at one time a part of a large farm, for many years in the possession of a family named Jenkins. This family still retains some land lying to the east of Mr. Cremen's property.

The three shell deposits described in this report are all on Mr. Cremen's land, two of them beside a small tidewater lake at the southern boundary of the site. A good volume of fresh spring water flows into the eastern end of the lake at all times of the year, sufficient to supply a great number of people.

Fig. 3 shows a plan of the site and the illustration at the top of Plate VII shows a view taken from a point near the outlet of the lake.

We have known of this site for ten years, but were only able to surface collect from it for the first two years, as the fields were removed from cultivation and were covered with weeds. Our surface collection consists of one grooved axe, some arrowpoints, sherds, and three gorget fragments.

Considering the site to warrant further investigation we asked for and received permission from Mr. Cremen to excavate. We chose for our first excavation one of the two shell deposits beside the lake, marked "A" (Fig. 3) on the plan. Beginning in the center of the deposit, where some sherds had been plowed up, we soon exposed a small fire place. A few feet to one side of the fire place we found a pit some four feet in depth, filled with oyster shells and some sherds, animal bones, and one arrowpoint. In test pitting through the remainder of the shell deposit we encountered a large group of sherds, all from a single large pot. There were but three vessels represented by the sherds found at this shell deposit, none restorable.

The deposit was about one hundred feet in diameter, extending about

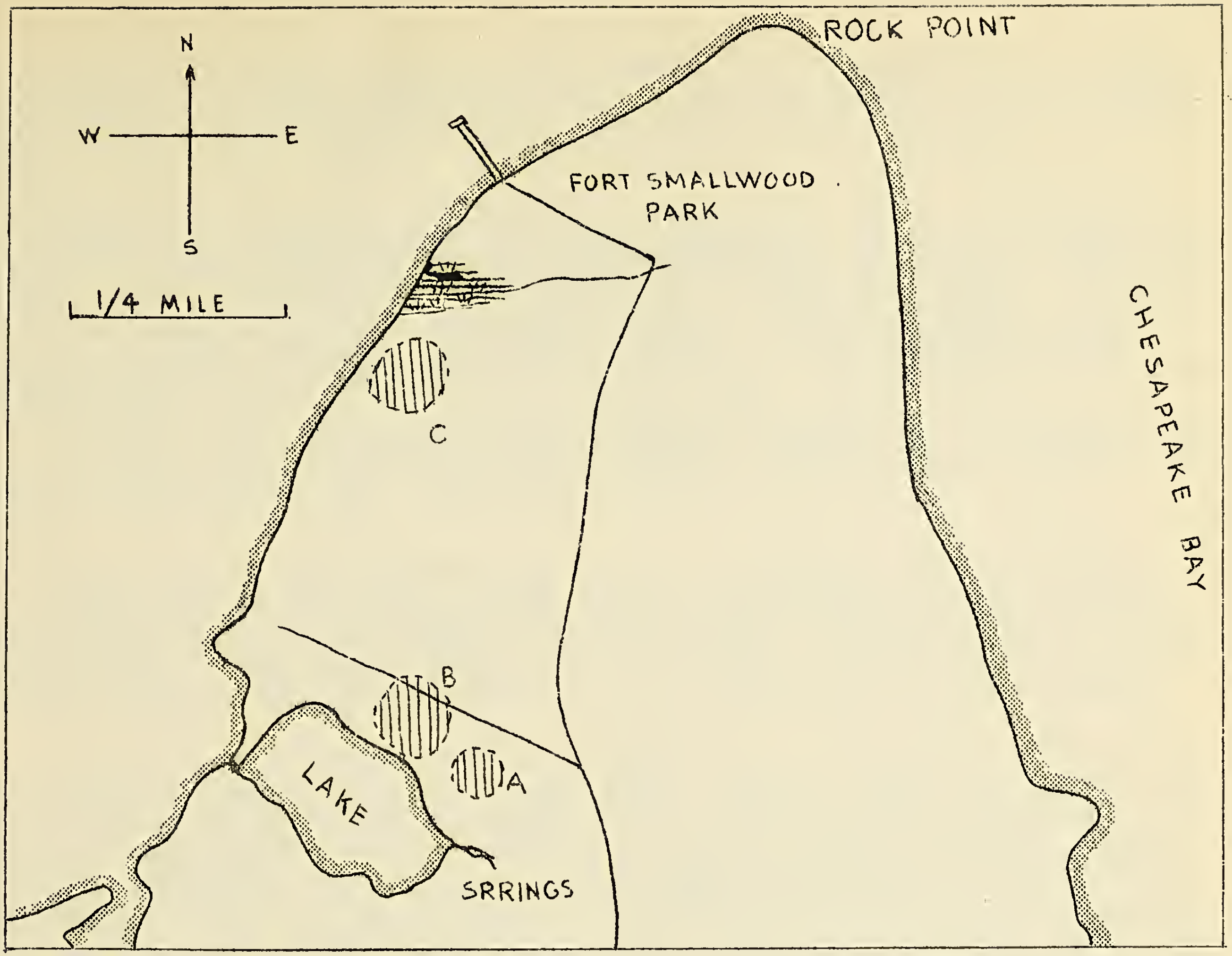

Fig 3 FORT SMALLWOOD SITE

▥ SHELL DEPOSITS

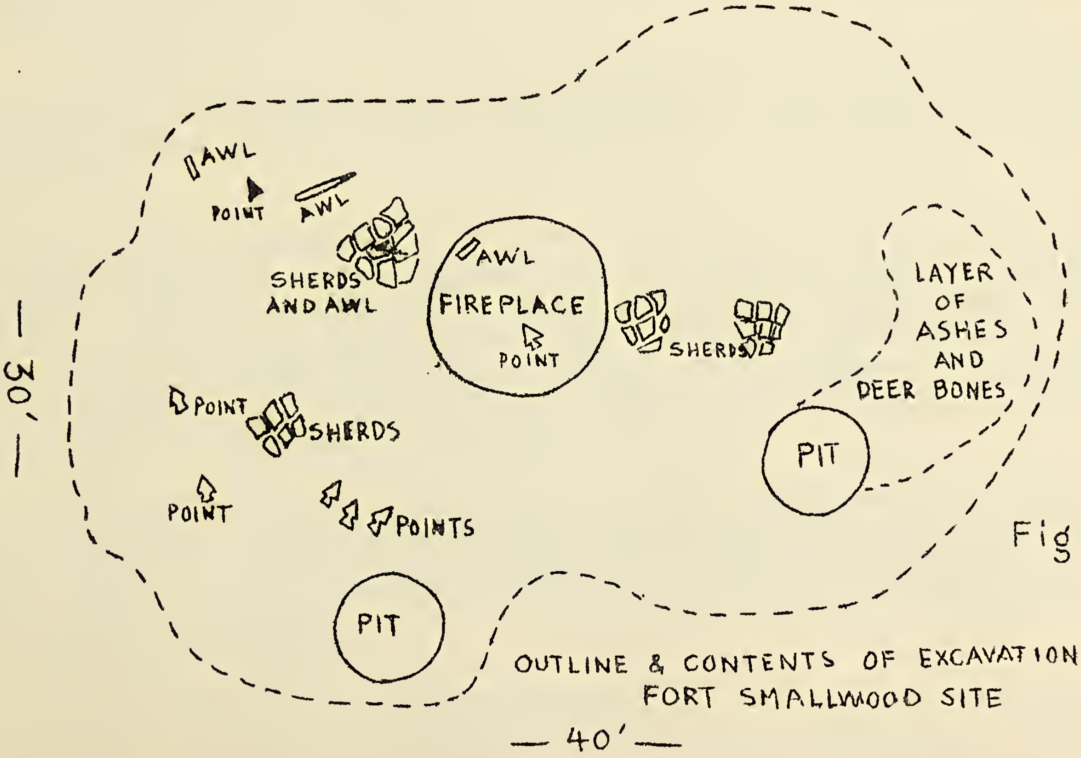

Fig 4

OUTLINE & CONTENTS OF EXCAVATION B
FORT SMALLWOOD SITE

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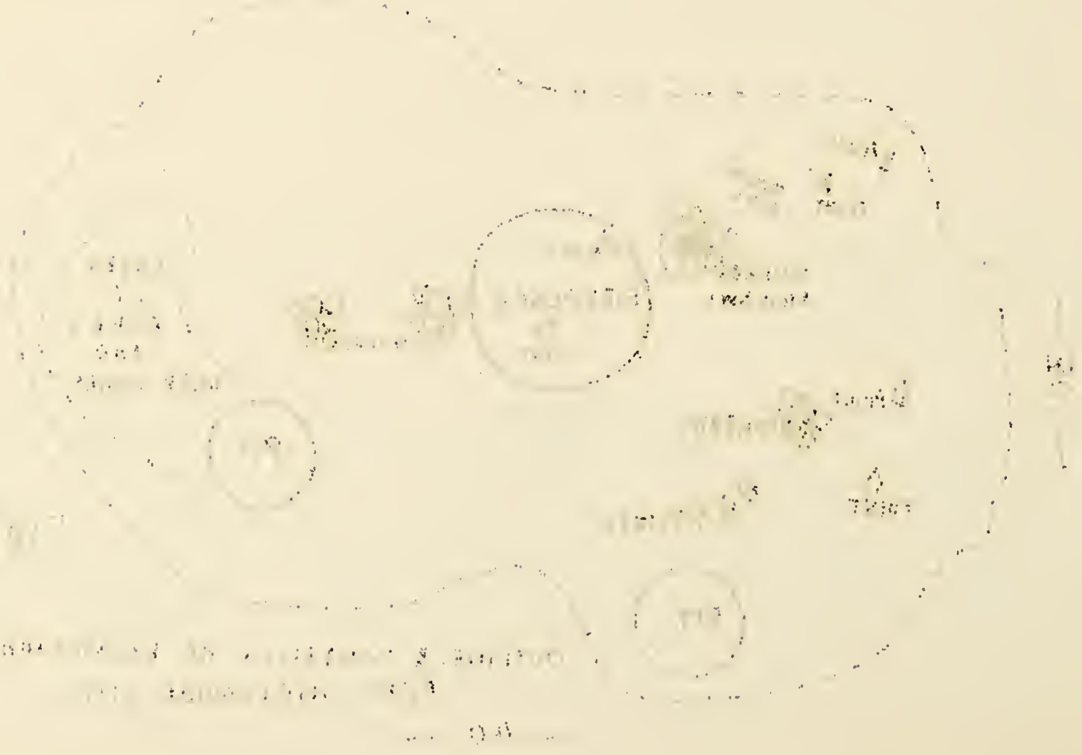

[illegible]

six inches below plow level in the center and thinning out at the edges where the shell occurred only in the top soil. It is evident that the deposit has been spread out and reduced in height by the plow.

This same condition applied to deposit "B" (Fig. 3) which we examined next. We excavated an area measuring thirty by forty feet in the center of this deposit, exposing a large fire place and two pits. We recovered from this area over a thousand sherds, representing some twenty vessels, six bone objects, ten arrowpoints, two hammerstones, and a quantity of animal bones, chiefly those of deer.

A chart has been prepared showing the extent of the excavation and the location of the fire place, pits, and cultural objects. (Fig. 4)

The fire place was about six feet in diameter and extended about six inches below the lower level of the surrounding shell refuse, which at this point was about fourteen inches deep, measuring from the surface. The soil within the fire place was black from charcoal and had stained the sand below it for a distance of eight inches.

A few inches below plow level and within the area of the fire place was a large group of sherds with a broken bone awl lying upon them. Surrounding the fire place were other groups of sherds. The two pits were filled with shells and were probably barbecue holes for roasting oysters. It occasionally happens that fire cracked rocks are found in such pits, and while we found none in these particular pits there were a few lying about them. One pit measured three feet wide and three feet deep and was solidly packed with shell. The other pit was also packed with shell but was smaller and contained some charcoal, bones, and sherds.

Beyond the margins of our excavation the shells continued for a distance of one hundred feet all around, but testing at distances of ten feet showed the deposit to contain no other fire beds and but few artifacts.

The shell deposit marked "C" on the plan (Fig. 3) was graded by Mr. Cremen while we were excavating the other places. While of considerable extent it proved to be quite shallow and contained very few artifacts. We did recover, however, several arrowpoints, a spear point, a dozen sherds, a broken gorget, a fragment of a grooved axe, and a steatite sherd. This sherd is the only evidence from the site of the use of steatite for making pots.

A great number of small pebbles were scattered through all three shell deposits. As some of these were still attached to oyster shells it is evident that they were dredged up with the oysters. They seemed to have been put to no use, except that those of good quality were made into arrowpoints.

The occurrence of artifacts was not confined to the shell heaps as we found a number of arrowpoints in the surrounding fields. Many artifacts have been found in past years by the Jenkins family and presented to the Maryland Academy of Sciences. They include axes and celts, arrowpoints and gorgets.

CERAMICS

About one thousand sherds were recovered from this site, representing approximately thirty-six vessels. The exterior surface impressions are mainly those of coarse fabrics although some sherds bear the marks of cords and nets. Tempering material consists of crushed quartz or oyster shell. Representative sherds are shown in Plate VIII. Decoration consists of notches at the rims, shown by Numbers 9 and 10, only two vessels being so embellished.

Sherd Number 12 is from the same pot as the large restored sherd shown on Plate VII. This vessel had been impressed with a coarse fabric but in addition a net had been used near the rim. Sherd Number 20 is from near the base of a pot and bears the impression of cords, and also shows the marks of basketry. It is possible that the base of the pot was placed in a basket of some sort as it was being formed.

Judging by the curvature and thickness of the sherds, it is evident that the vessels used at this site were rather large and resemble closely those found at Booby Bar and Rocky Point.

BONE IMPLEMENTS

The bone implements from this site were all recovered from excavation "B" and are shown in Plate IX. Number 39 is a tubular piece of bone beveled at one end. It may have been used as a gouge-like scraper and was probably longer originally. Number 40 is a much worn awl made of a scapula, probably of a deer, but it seems to be rather small unless the animal itself was either small or immature. Number 41 shows some polish and was probably used as an awl. Number 42 is an awl made of a split antler and 43 is made of a piece of the cannon bone of a deer. One other section of an awl was recovered resembling Number 43 in cross section.

STONE ARTIFACTS

Our collection of chipped implements from this site numbers about fifty specimens. Some of these are shown in Plate IX, those in the lower panel coming from excavations "A" and "B" (Fig. 3); the remainder were found on the surface. The materials are rhyolite, quartz and quartzite. Number 9 is an interesting specimen because the base and notches are considerably worn, probably from use as a scraper. Only two triangular points were found.

We were able to find but one grooved axe from this site (Number 27); however a Mr. Davis, who was a member of the Jenkins family, in the year 1878 presented to the Maryland Academy of Sciences a noteworthy collection of artifacts from this site, including five axes and one celt. These are shown by drawings in Fig. 5.

Two gorget fragments are shown in Plate IX, Number 29, of light grey slate, and Number 30 of black slate. An oval two hole gorget made of mica schist was found some years ago. Fig. 28 is a fragment of a steatite pot, found in shell deposit "C" (Fig. 3).

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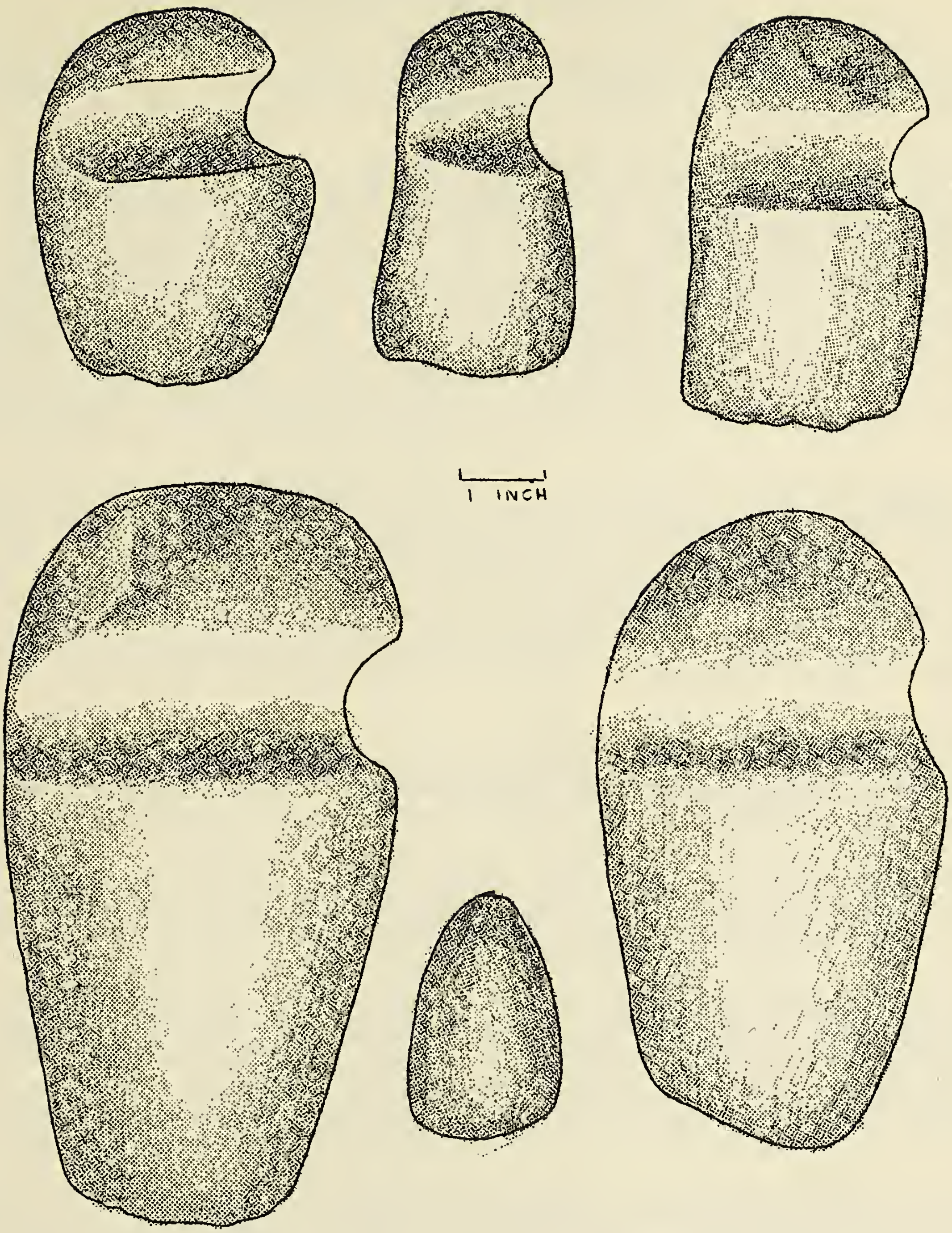


Fig 5 AXES AND CELT PRESENTED TO THE MARYLAND ACADEMY OF SCIENCES BY Mr. DAVIS IN THE YEAR 1878 FROM ROCK POINT, ANNE ARUNDEL COUNTY, MARYLAND

IV LITTLE ROUND BAY CREEK SITE

This site is situated at the mouth of Deep Ditch Branch, a small stream that drains into the western extremity of Little Round Bay Creek, which is a tributary of the Severn River in Anne Arundel County.

The site, though but a small one, is important because it is in a woods which has never been disturbed by cultivation, and except for several excavations, made for the purpose of obtaining road fill, was just as the Indians had left it. The principal features of the site are a series of small oyster shell deposits scattered along a low sandy ridge, and so covered with leaves and mold, as to be almost indiscernible. As a matter of fact, our attention was drawn to these shells only because they were exposed by the road fill excavations; otherwise we may never have found the site. A plan (Fig. 6) shows the distribution of the shell deposits.

A rather strange feature of the site concerns the bisecting of the sandy ridge upon which it is located, by Deep Ditch Branch. The cut is about eight feet deep and appears to be artificial. If so, it must have been made many years ago as some large trees are growing upon its sharply sloping sides. It was probably made by white men for the purpose of draining the swamp which occurs to the north of the ridge, and which no doubt interfered with an earlier road through this region.

Through excavation it became apparent that the main inhabited part of the village was at the northern end of the sandy ridge as most of the cultural objects were found in the shell refuse there.

The deposits to the south except "C" (Fig. 6) were found to contain nothing in the way of artifacts, and little in the way of refuse except shell."C" contained an incomplete human skull and some sherds.

Our first work at the site was begun in 1930, during which time we thoroughly dug over the small portion remaining of the eastern edge of the ridge. The shell deposit was rather evenly distributed about the edge but thinned out in places near the road, and was in no place more than eight inches thick. The leaf mold covering averaged three to four inches in thickness.

Over a hundred sherds were recovered, three bone awls, one broken clay pipe and some bones of animals and fish. The three bone awls are shown in Plate XII, Numbers 5, 6 and 7. Numbers 5 and 6 are made of split cannon bones and Number 7 of the ulna of the deer. The pipe (Plate XII, Number 13) is crudely made, and probably was deposited entire. However the stem is partly gone because of insufficient firing.

The northwest and southern sections of the site were not worked until 1940. It is unfortunate that the center of the northern part of the site had been removed, as it is probable that the house or houses stood there, and some additional material may have been recovered. However it is equally fortunate that the entire section was not destroyed as we found that the edges of the ridge had been used as a dumping ground.

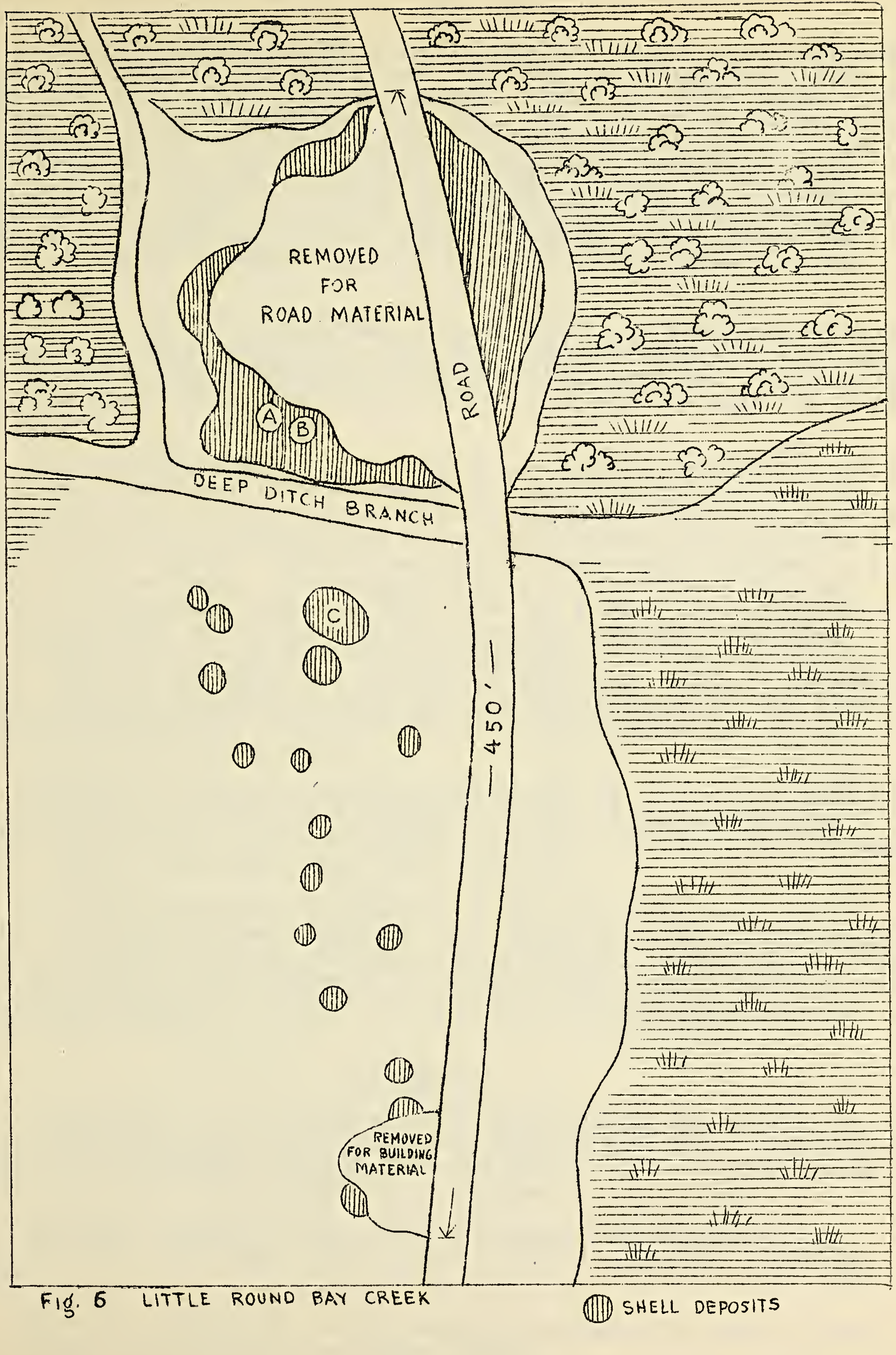


Fig. 6 LITTLE ROUND BAY CREEK

During the work in 1940 a great number of sherds were recovered, together with four additional bone awls and some flint implements. Three pits and a fire place were found. These are shown on the plan and are lettered "A", "B" and "C" (Fig. 6). Pit "A" was rather interesting: it had been made before the layer of shell above it had been deposited, as about 6 inches of clean sand lay between it and the shell layer above. A sectional drawing of this pit is shown in Fig. 7. The contents consisted of shells, earth stained very dark with ashes, animal bones and a number of sherds from a single pot. Two sections of the upper portions of this pot are shown in Plate X a.

Pit "B" (Fig. 6) contained several bushels of clean oyster shells and extended about eighteen inches below the surrounding shell layer. Cultural material in the pit consisted of one sherd and four bone awls. The awls are shown in Plate XII, Numbers 1-4, and the sherd in Plate XI, Number 3.

The fire place "C" (Fig. 6) which contained a quantity of ashes was located just south of the branch and was the only artifact producing area from this point southward. The lowest point of the fire place was about 14 inches below the surface and was surrounded by a shallow shell deposit. Sherds and animal bones were scattered in and about the fire place. The fragments of an antler from a deer were found in association with the brain case of a human skull (referred to herein above) which was also in fragments. We dug a few feet around this area in an effort to locate a grave but met with no success. Neither the skull nor the antler showed any signs of artificial work, with the exception of the tines of the antler which had been crudely knocked off. The tines had been removed from all of the antlers recovered at this site.

Although we found no antler arrowpoints, it is possible that the tines had been used for this purpose. A part of the mandible of a beaver, containing one of the grinding teeth, was recovered in a small shell deposit fifty feet from the fire place.

The shell deposits southward from the fire place were rather small, the largest measuring only 11 x 14-1/2 feet and having a thickness of 9 inches under a leaf mold layer 3 inches thick. Aside from some animal bones, no refuse of a cultural nature was noted. Testing revealed no shells or evidence of habitation in the areas between these shell heaps.

CERAMICS

Approximately 600 sherds were recovered during the work at this site. Pots represented by the sherds numbered about 30. With the exception of six sherds, all the ware was of one type. A description of the six exceptional sherds is as follows:

Plate XI, Number 16 - the rim of a small bowl-shaped vessel, tempered with shell which has leached out, and impressed with fine cords.

Plate XI, Number 10 - a rim sherd, tempered with crushed quartz and bearing impressions of a coarse fabric.

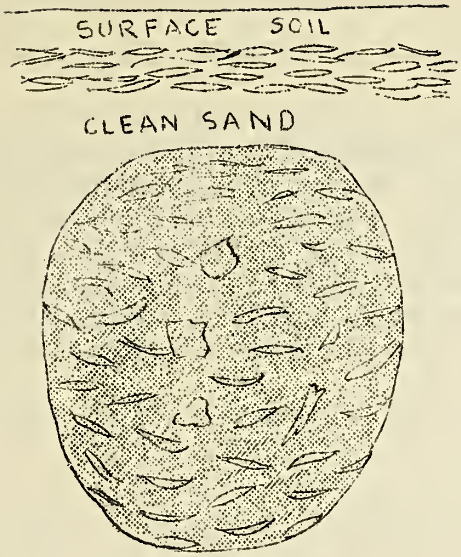


Fig. 7

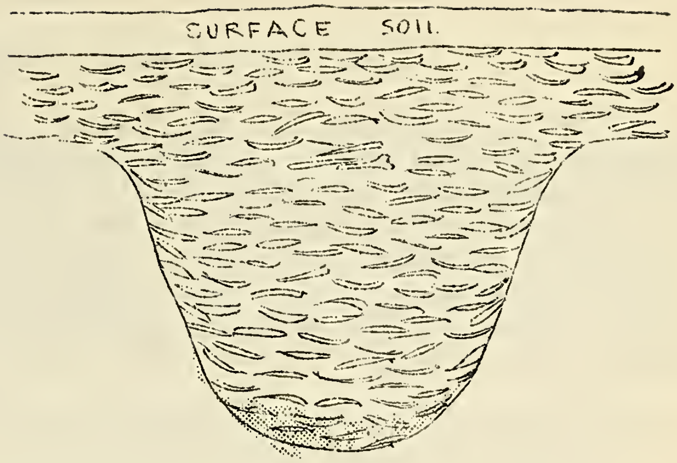


Fig. 8

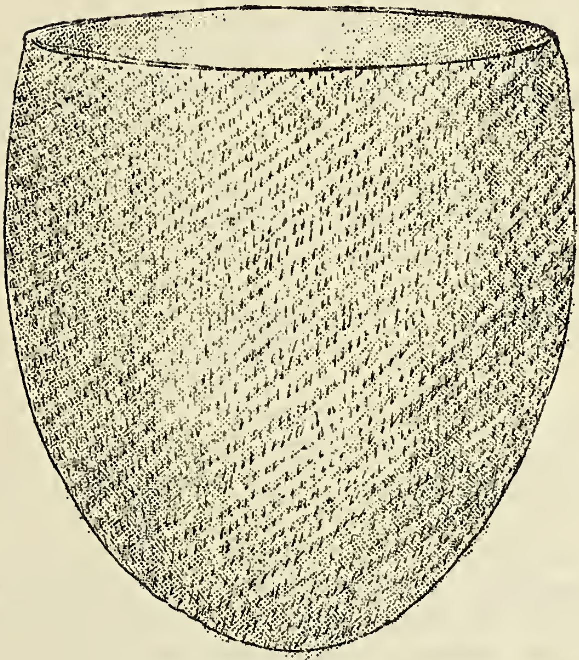


Fig. 9 BOTH ABOUT 1/4 ACTUAL SIZE

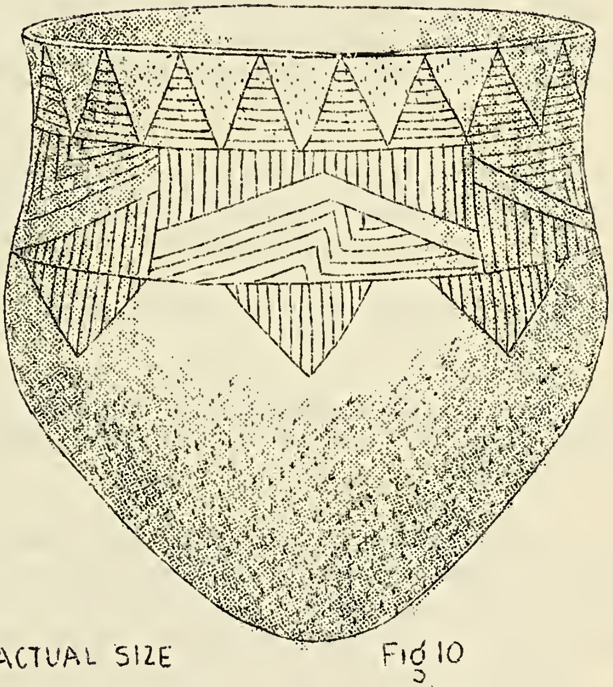


Fig 10

Plate XI, Numbers 14 and 15 - sherds tempered with crushed quartz and bearing the impressions of a net.

Plate XII, Number 9 - a bottom disk from a pot.

The remaining sherds, which consist of the great bulk of the ware recovered have the following characteristics. They are all tempered with oyster shell and bear on their outer surfaces impressions which seem to resemble basketry. Whether or not these impressions are actually those of basketry is a problem that the writer has not attempted to solve. A piece of closely woven matting may produce the same result. The impressions, which show overlapping, suggest that a small piece of material was used, either held in the hand or wrapped on a paddle.

Nine of the vessels bore incised decorations on the neck just below the rim. A description of several of these is as follows:

Plate X - two restored sherds from the pot found in pit "A" (Fig. 6). We have, in addition to these, a number of sherds from this same pot, enough in fact to attempt a complete restoration. At the present time a restoration has not been made. However, a drawing of this vessel (Fig. 10) will be used to show how this pot would look. The design is quite complex, though typical of Tidewater Maryland, and covers a large portion of the vessel. The paddle impressions have been partially smoothed away on that part bearing the design. The color of the paste is brown, rather dark in places from lying in contact with ashes and is shell tempered. Soot still adheres in places to the walls.

Plate XI, Numbers 6 and 8 - these two sherds were found a few feet distant from pit "A" (Fig. 6). Although from a different pot, they greatly resemble the sherds found in this pit.

Plate XI, Numbers 11, 12, 13 - these three shell tempered sherds are from one vessel.

Plate XII, Number 8 - these two sherds are broken along the coil and fit together. The lower sherd had been pinched with the fingers before the upper coil was molded on.

Plate XII, Number 10 - A great many fragments of the vessel represented by this sherd were recovered. scattered over an area ten feet square slightly to the west of pit "A" (Fig. 6). Included in these sherds are the base and a part of the side walls up to the rim. While a complete restoration of this pot is possible, the writer has not yet finished this task. A drawing will suffice to show its shape and dimensions (Fig. 9). The tempering material is shell which has leached away in places. The writer has found at various sites a great many sherds which show evidence of partial and complete leaching away of the shell tempering material. It is obvious that the heat necessary to vitrify clay would also have a tendency to slack the lime of the shell. If these sherds are subjected to drainage from an acid top soil there is great possibility that the shell will leach out.

Plate XII, Number 12 - a sherd from a small cup-like vessel of a light brown color, without tempering material and showing two horizontal incised lines below the rim.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Plate XII, Number 13 - a crudely made untempered clay pipe mentioned heretofore. The stem had been poorly fired and had partially dissolved.

STONE ARTIFACTS

Six arrowpoints and one pitted stone were all that were recovered in the way of stone implements. The arrowpoints are shown in Plate XII; Numbers 14, 15, and 16 are made of quartz; Number 17 of a light brown stone resembling quartzite; Number 18 of a coarse grained brown jasper; and Number 19 of rhyolite. Many chips were found consisting of the following materials: quartz, quartzite, rhyolite, also a few chips of jasper and dark colored flint. The pitted stone was an oval pebble of sandstone, eight inches long and slightly pitted on two surfaces.

Scattered throughout the shell deposits were a number of small pebbles, chiefly quartz, which had probably been dredged from the river attached to oysters, as an occasional few still adhered to the shells.

*****

V CONOWINGO

This site, one of the largest in Maryland, is situated on the east bank of the Susquehanna River, in Cecil County, at the present location of the Conowingo Dam. At this point a large flood plain, averaging one-quarter mile in width, extends southward from the dam for a distance of approximately three miles. Above the dam, in that part which is now under water, the flood plain extended for another quarter mile. The river below the dam is wide and shallow, becoming quite dry in late summer so that one can walk over the rocks to Rowland Island, approximately three-quarters of the distance to the western bank. Evidence of aboriginal occupancy borders the river, extending from the dam southward to Octoraro Creek and in a large field on the southern bank of Octoraro Creek at the Port Deposit Road.

For many years before the erection of the dam, this site was known locally as Cromley's Mountain field, and was a favorite hunting ground for collectors. Before the disastrous flood of March, 1936, the area on this site from which artifacts could be found extended from the dam to the mouth of Octoraro Creek. A wide beach occurs along this stretch of the river, upon which the annual spring floods deposit the heavier material washed from the adjacent field. During the flood just referred to, most of the gates of the dam were open for three days, and at one time all were open. Nearly the whole of the northern half of the site was washed away by the raging waters, which rose so high as to flood long stretches of the Port Deposit road and to cover the flood plain with eight or ten feet of water. A great many artifacts were found after the waters receded, but a vastly greater number must have been washed away and lost.

After the soil was washed away the rocky bed of the river was exposed, which apparently extends under the entire flood plain. Over these rocks there is a mantle of hard packed reddish-brown silt, about three feet thick, above which there is another layer of less densely

packed sandy silt. This upper layer washes out much faster than the lower one, the result being that the lower layer forms a beach which retains the material washed from the upper layer. The width of this beach varies from about thirty feet near Octoraro Creek to about two hundred feet near the dam.

Artifacts occur only in the upper layer. Nothing whatsoever of man's handiwork has been found by the writer or any of his co-workers in the lower strata. The upper layer varied from two to five feet in thickness, artifacts occurring at all levels. Some charcoal was observed here and there, but no animal bones or bone artifacts were noted.

Half way between the mainland and Rowland Island is a small island containing a wooden tower. This island is about one hundred and fifty yards long and fifty yards wide and showed evidence of occupation over its entire surface, consisting of chipped implements, sherds of clay and steatite and other objects similar to those found on the mainland.

The flood of March, 1936, carried away all the soil from this island, leaving only the high rocks forming the base and the wooden tower, which was firmly anchored.

Rowland Island contains a small village site on a low sand spit at its down river end. The high flat surface of the island does not seem to have been occupied as we found no artifacts upon our several visits. The artifacts from the sand spit are similar to those found on the mainland.

POTTERY

During our eight years of collecting from this site we managed to find some two thousand sherds. The majority of these sherds are from large vessels, tempered with crushed quartz, granite, schist, steatite and other rocks, and bearing the impressions of cords, fabrics, and a few examples of nets. Only one sherd of this type was decorated. The design is a broad scratch mark in the form of a V, probably continued around the vessel just below the rim, but the sherd we have is small and bears only one element of the design. It is rather crudely done and resembles similar attempts at decoration on the Popes Creek style of ware from the Potomac River.

Five sherds of this type of ware are shown in Plate XIII, Numbers 12 to 16.

Number 12 is cord marked and light grey in color on the surface, darker inside. The very light surface color may be due to weathering. Several hundred sherds of this type were found.

Number 13 is cord marked and brown in color; this is also a very common type.

Number 14 is similar to Number 12, except that the cord markings have been crossed, forming an impression somewhat resembling a fabric.

Number 15 is a small buff-colored sherd bearing a net impression.

Number 16 is a brown-colored sherd bearing a fabric impression.

Many shords bearing fabric impressions were found but were not so numerous as were those having the impressions of cords.

Just beneath the dam, covering an area of about two acres, was a site bearing evidence of fairly recent occupation. This was the only place at Conowingo where we found traces of fire places or refuse pits. No longer can they be seen, however, inasmuch as the 1936 flood, referred to heretofore, washed away the site clear to the rocks of the old river bed. This place is shown on the map (Fig. 24) by a dotted area marked "A".

Charcoal was observed in a number of places mingled with sherds and animal bones, chiefly those of the deer. We have noted animal bones at Conowingo in no other place except this one spot. During the construction of the dam this area was disturbed to such an extent by the erection of buildings, machinery, and other activities connected with the work, that no well defined pits were found, the refuse occurring in small pockets near the surface. Nearly two hundred sherds were collected,which from their somewhat fresher appearance seem to be more recent than the pottery from other parts of the site. Some rim sherds are shown in Plate XIII, Numbers 1 to 5 inclusive. They are tempered with crushed stone, quartz predominating, and range in color from light brown to dark grey. The exterior cord markings are those of cords, while the design, when present, was usually applied by incising excepting Number 5, where a cord wrapped stick was used. One sherd bears a design of four parallel cords and is still coated with soot, giving it a greasy polished appearance at the rim, probably due to handling by the Indians. Soot was observed on a number of sherds that were obtained through digging. Scattered over this area were chips and arrowpoints of quartz and rhyolite and a celt. In digging we found mingled with sherds a slender stemmed arrowpoint of shale, a very small brown jasper triangular point and a small piece of the bowl of a clay pipe. This pipe fragment was finely made, thin, of very light colored clay and bore a very thin dotted line below the bowl rim, applied with a roulette. This could be part of a trade pipe as the clay very closely resembles that used in their manufacture.

The two sherds shown in Plate XIII, Numbers 7 and 8, are similar to types found in the shell heaps further to the south along the shores of the Chesapeake and appear to have originally been tempered with shell, but this has leached out.

Three sherds are shown in Plate XIII, Numbers 9,10 and 11, which have collared rims. They do not, however, appear to be of Iroquoian types.

Although some of the sherds from Conowingo may represent pottery of Iroquoian occupation, none was found which could definitely be said to bear the characteristic embellishments peculiar to this type of earthenware, such as modeled human figures and faces, or collared and castellated rims with nodes on the lower edge.

The sherd shown in Plate XIII, Number 6 is reddish-brown in color, very gritty in composition and bears a fine incised design. The surface is rough, which may be due to weathering. Two other sherds of this type were found, bearing similar decoration and a few body sherds. These also had a rough surface; they may have come from the same pot.

PIPES

We were not very successful in our search for pipes at Conowingo, as we found only four fragments, two of clay and two of stone. One stem, made of clay, was cracked lengthwise and came apart, revealing a perfect mold of a thick cord. This was a very ingenious method of forming the stem hole as the cord would burn out when the pipe was fired.

The other clay fragment was a part of a stem and the base of the bowl which contained some elements of a cross hatch design.

Of the stone fragments, one was a small piece of a bowl of steatite, and the other a piece of a bowl of light brown sandstone. We saw a fragment of this same sandstone pipe in the possession of another party and from an examination it would seem that it was made in the shape of a tapering tube.

STONE ARTIFACTS

Among the many stone artifacts recovered from this site, bannerstones are probably the most notable. We obtained altogether about one hundred fragments and several complete finished and unfinished specimens. The most characteristic form is shown by Fig. 13. Steatite, black slate and schist are the materials of which the majority of these objects were made, although sandstone, granite and various other forms of shale and slate were used occasionally. In size the type illustrated by Fig. 13 varies from about two to eight inches across the wings. We have found many wing tips showing evidence of cutting, suggesting that in the event of breakage of one wing, the opposite wing was sawed off to match.

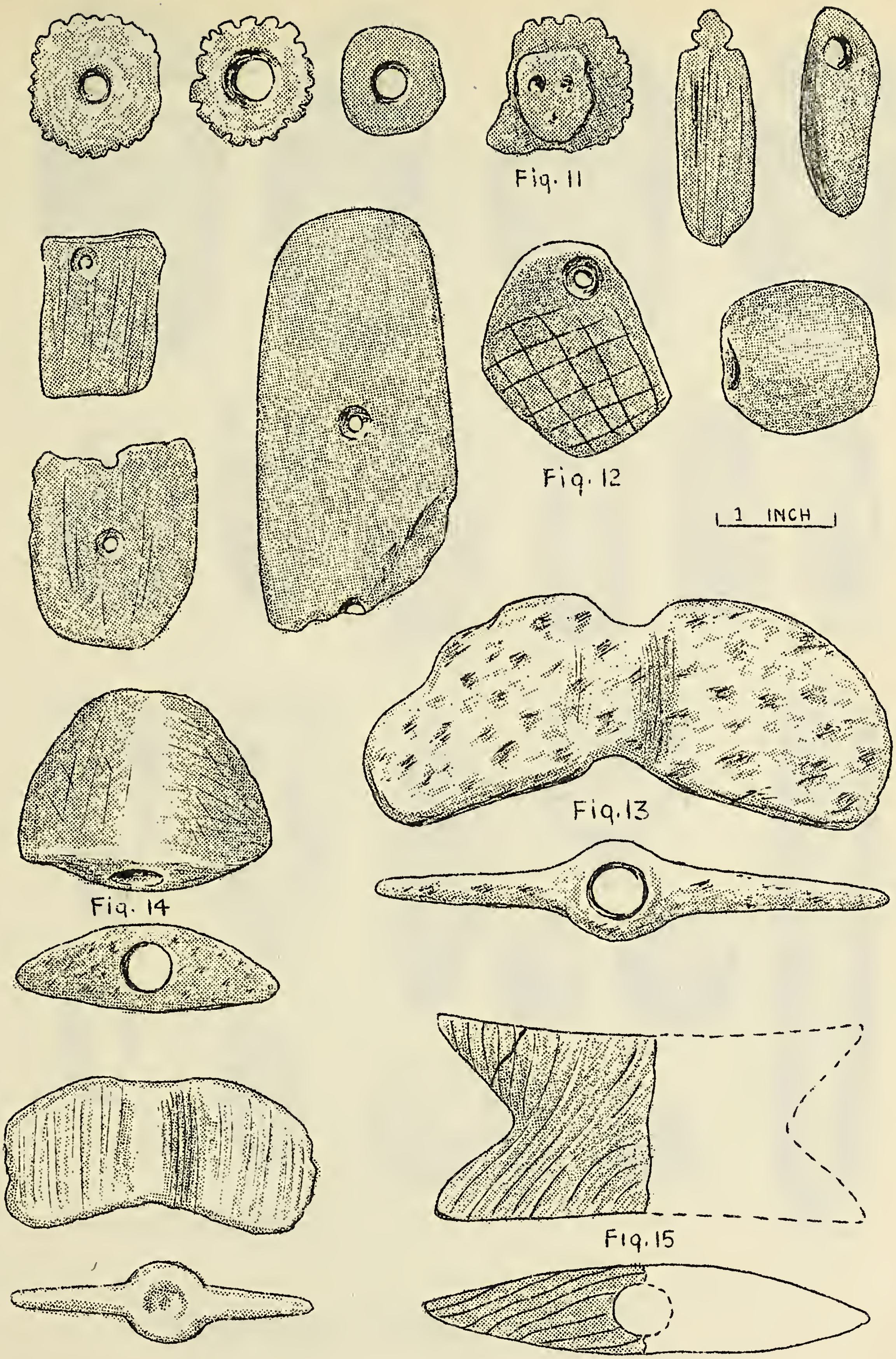
Occasionally holes were bored along the break for the purpose of lashing the two parts together. The wings of several broken bannerstones in the collection are notched or grooved and the jagged broken edges ground smooth. Evidently these objects were thought too valuable to discard and so were used for other purposes.

Another very characteristic form of bannerstone found here is illustrated by Fig. 14. Steatite seems to be the material that was preferred for this type as we have found very few made of other stones.

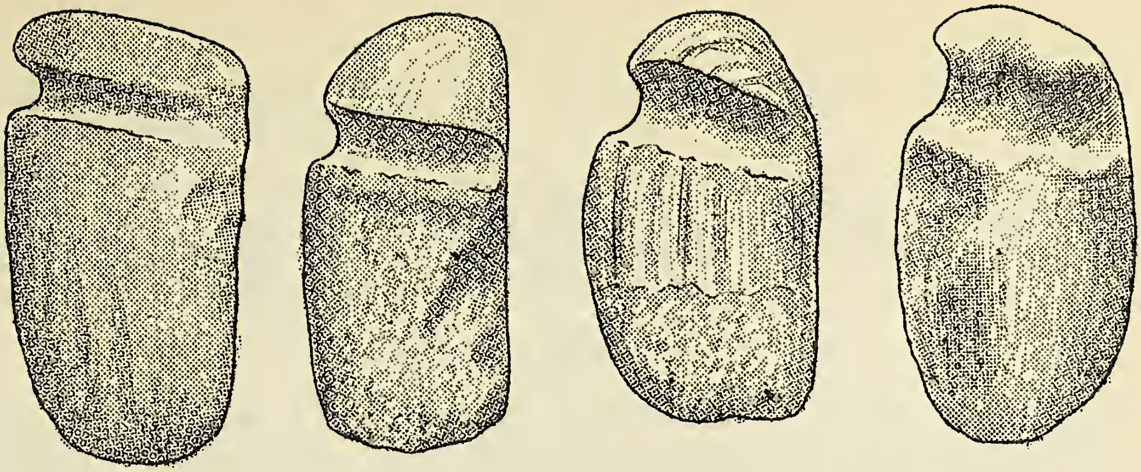
An unusual specimen made of banded slate and of a type that is more frequently found in the Ohio Valley is shown by Fig. 15. A well made rectangular single hole gorget, also of banded slate, was found at the same spot where the bannerstone was picked up.

A few gorgets and pendant ornaments have been collected. They are not nearly so numerous as bannerstones, and most of those we have are broken. The material of which they are made is usually slate of various types and some have designs engraved on the surface. A pendant made from the wing of a bannerstone of steatite has both surfaces engraved with a cross hatch design (Fig. 12).

One of the most interesting objects in the collection is a small notched disk of green schist, one and one-half inches in diameter with



CONOWINGO - BEADS, PENDANTS, GORGETS AND BANNERSTONES



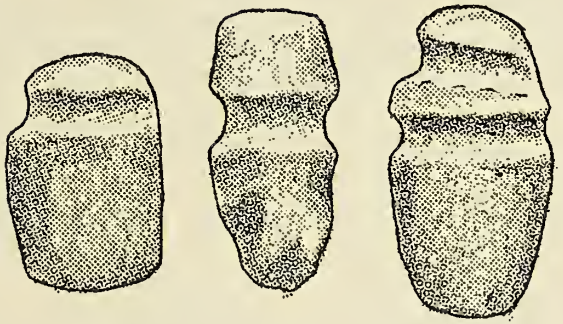


Fig. 16

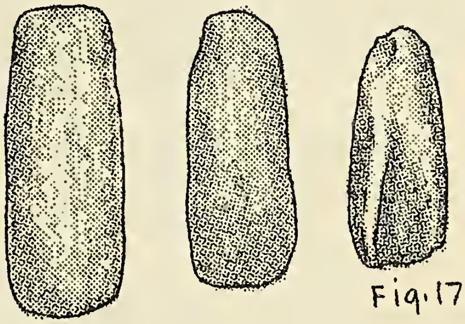


Fig. 17

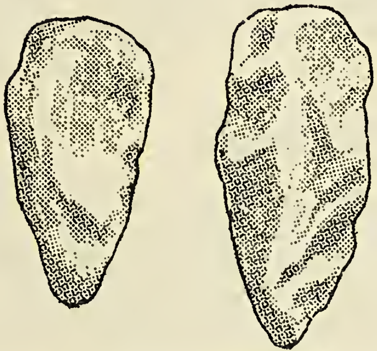
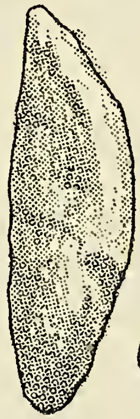


Fig. 18



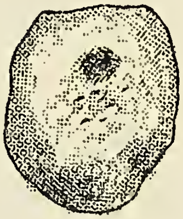


Fig. 19

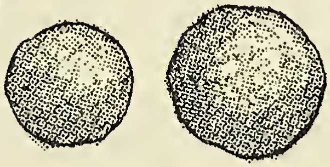


Fig 20

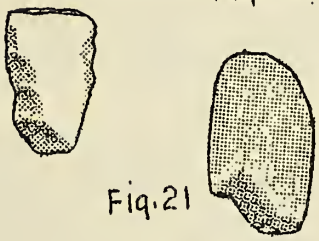


Fig. 21

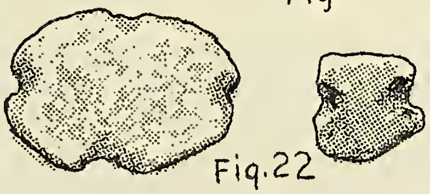


Fig. 22

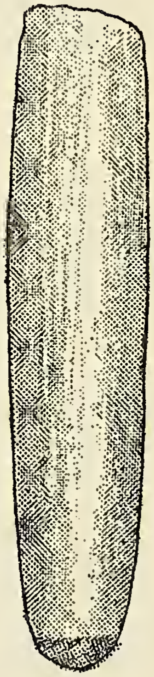


Fig. 23

6 INCHES

CONOWINGO - STONE ARTIFACTS

a raised central section upon which is carved a crude human face. This specimen is shown by Fig. 11.

We have found several interesting disk beads of steatite and black slate with plain and notched edges averaging an inch in diameter and from one-sixteenth to one-quarter inch in thickness. Some of these are shown by drawings at the left of Fig. 11.

AXES AND CELTS

Eight complete and a number of fragmentary grooved axes were found. Most of these are three-quarters grooved, with the groove placed close to the poll and slanting downward from front to back. Trap rock and other stones were used for their manufacture, several having weathered to such an extent that only by breaking the specimens could the rock be viewed in its original condition.

One axe is double grooved; this is shown by a drawing (Fig. 16).

A small gouge (Fig. 17) was found on the island with the wooden tower.

Celts do not seem to have been used to the same extent as were grooved axes, although we found quite a number, mostly broken. About seventy-five percent were made of a dark stone of a purple color which has weathered badly, the remainder being made of trap rock and one of red sandstone.

HAMMERSTONES AND OTHER OBJECTS

Hammerstones were quite abundant. They are made of quartz and trap rock, the form usually being spherical, though a few are disk shaped. Pitted hammerstones were not at all abundant, only a few having been found. Two spherical hammerstones are illustrated by Fig. 20 and a pitted hammerstone by Fig. 19.

A number of roller pestles were found, all either unfinished or broken, and only three specimens showed the high polish at the ends which indicates much use. (Fig. 23).

The abrading stones from this site do not differ from specimens we have found at other sites in Maryland, for they show the same abraded surfaces and grooves, the result of grinding some objects, probably the edges of axes and celts. Two specimens are shown by Fig. 21. We did not succeed in finding any so-called sinew stones at this site.

Some notched sinkers or weights were found, made of any small flat boulder suitable for the purpose. Two specimens are shown by Fig. 22. One very large specimen, weighing about ten pounds and possessing two deep notches pecked in the sides, was recovered from Rowland Island. This had also been used as an anvil stone as the two flat surfaces had been deeply scarred by hammering.

Steatite was used quite extensively for the manufacture of cooking pots. Stone picks for working steatite were also quite abundant at the site. These picks are of the same types as those found at the

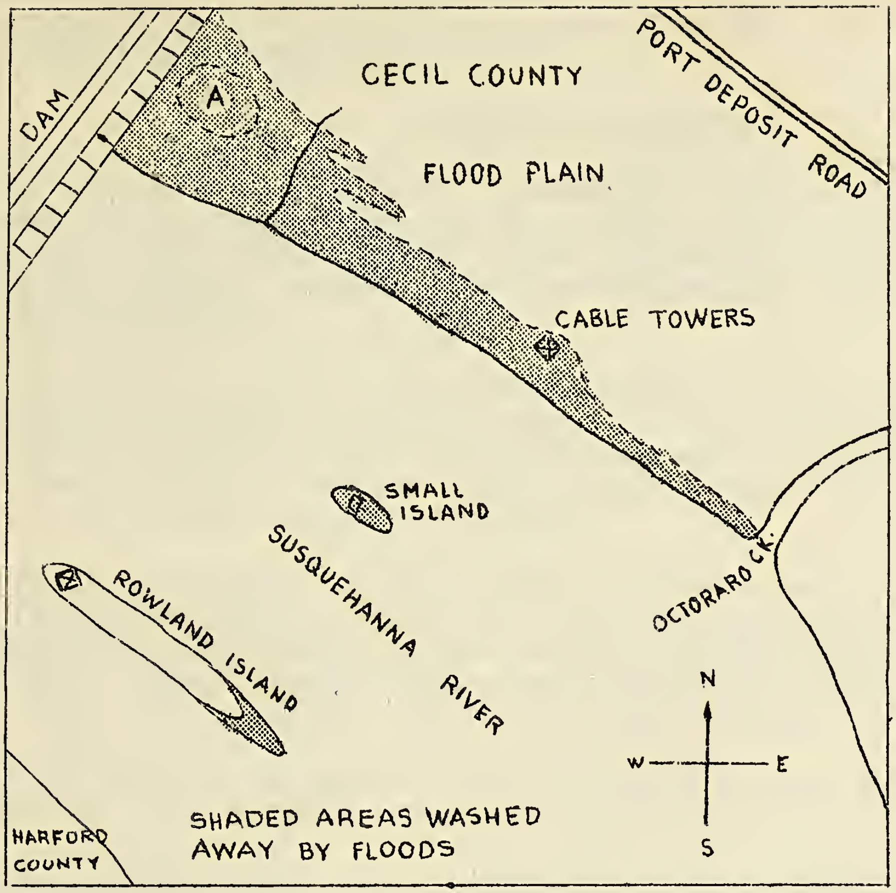


Fig. 24

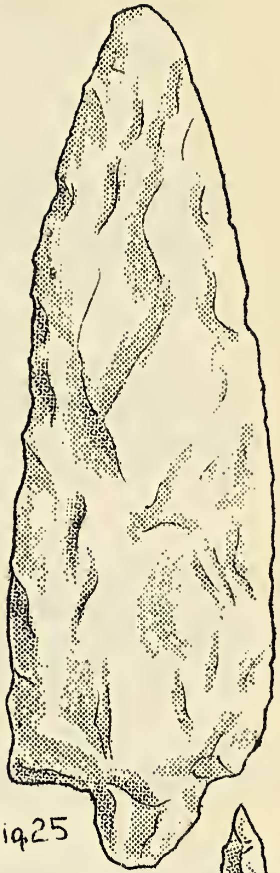


Fig. 25

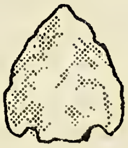


Fig. 28

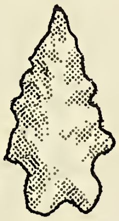


Fig. 35

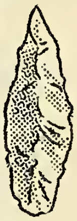


Fig. 29

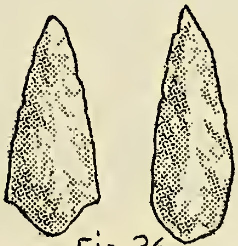


Fig. 26

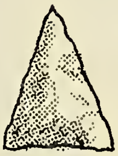


Fig. 27

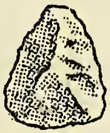


Fig. 34

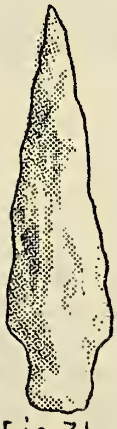


Fig. 31

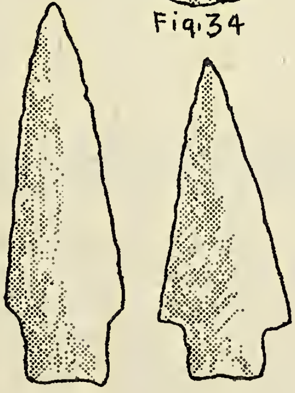


Fig. 30

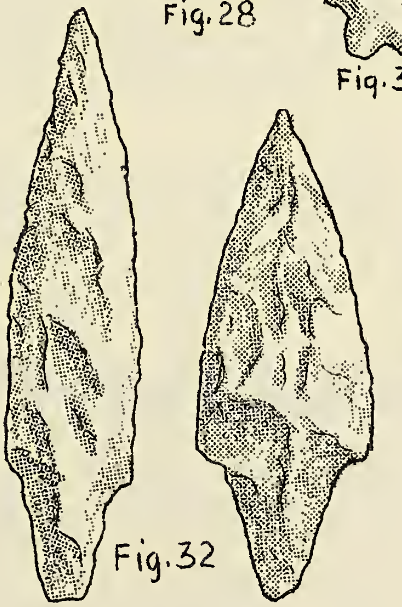


Fig. 32

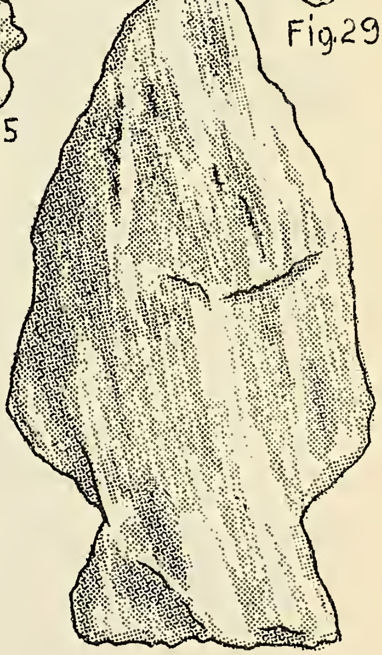


Fig. 33

CONOWINGO - CHIPPED IMPLEMENTS

aboriginal steatite quarries of Maryland and Pennsylvania. Three picks are illustrated by Fig. 18.

CHIPPED IMPLEMENTS

Of the various types of implements found at Conowingo, none is so numerous as flaked projectile points, spearheads, knives, and scrapers. Many thousands of these implements have been found by collectors in past years. Our own collection contains about one thousand specimens.

The common type of projectile point in use at Conowingo was of the stemmed variety, usually made of quartz, quartzite and rhyolite. A typical example is shown by Fig. 30, made of quartzite. Points of less common occurrence are shown by drawings, Figs. 26, 27, 28 and 35, and are usually made of quartz.

Small triangular points made of quartz and a dark colored chert were fairly abundant. This dark colored chert was also used in making small stemmed points and a slender type with a thick cross section, (Fig. 29). These slender types were sometimes used as drills, as we have found several that were worn smooth on the ends.

Most of the scrapers in the collection are small and are generally made of dark colored chert. (Fig. 34).

Spearheads were made of rhyolite and a rough textured grey rock resembling trap rock. The objects made of this latter rock are all spearheads, averaging from four to six inches in length, though some occur larger, and are all of one type. Two specimens are shown by Fig. 32. There seem to be present more large forms made of this rock than of rhyolite. Fig. 25 shows a spearhead of rhyolite from Rowland Island, which is the only complete large object of this material in the collection. A crude spearhead of hornblende (Fig. 33), was found on Rowland Island, the notches being ground instead of chipped.

About thirty-six projectile points were recovered that were made of argillite and shale and were of the type of Fig. 31, a specimen of argillite.

*****

VI SITE AT THE JUNCTION OF THE LITTLE GUNPOWDER RIVER AND THE NEW PHILADELPHIA ROAD

This site, which is not very large, was brought to the writer's attention by Mr. William B. Marye, who discovered it some years ago. Among the artifacts found by Mr. Marye were two celts and numerous arrowpoints and sherds. Most of the sherds are of the basketry impressed type, with incised decoration on some rim pieces. Several sherds are cord marked. Tempering material consists of shell, crushed quartz, and one sherd contained steatite. Arrowpoints are of both stemmed and triangular types, about equally divided. Materials are rhyolite, quartz and a few of argillite and jasper. This site contains no shell deposits.

*****

VII BODKIN CREEK

There are two sites which we have examined on this creek. One is on the north shore about one-quarter mile from the entrance to the creek and contains some thin shell deposits. The only artifacts which we have been able to find consist of a few stemmed arrowpoints of quartz and rhyolite and some sherds bearing the impressions of cords and fabrics, and tempered with crushed quartz or shell.

The other site contains a shell deposit which extends for two hundred feet just outside the entrance of Bodkin Creek, on the south shore. We recovered about one hundred sherds that had been washed out of the shell bank by storms. These were cord and fabric marked, tempered with crushed quartz, beach sand, or shell, and bore no decorations.

*****

VIII KENT ISLAND SITES

These sites consist of two groups of shell deposits, one near Love Point and the other about one mile south of Love Point, both facing the Chester River. In addition there is some shallow deposit at Kent Island Landing. The location of the shell deposits is marked on the map (Fig. 36).

We have made but few visits to these sites and consequently our own collection is rather small. However, we have examined and photographed an excellent collection belonging to Mr. James Marks of Love Point. This collection covers the entire range of artifacts likely to be found here, with the exception of bone articles and pipes. Two stone pipes were washed out of graves some years ago, but have not been available to either Mr. Marks or the writer, so we do not know what types they are.

With the exception of some of the sherds, all the illustrations used in this report of the Kent Island sites are of specimens in Mr. Marks' collection.

POTTERY

We have available for study about one hundred sherds. Mr. Marks had at one time a great many more, but these were lost during a period when he was absent from his Love Point home, and they cannot be located now.

The sherds are impressed with cords and fabrics and contain crushed quartz or shell as tempering material. No form of decoration was noted. A few sherds are illustrated in Plate XIV.

STONE ARTIFACTS

About twenty grooved axes and half that number of celts have been recovered from these sites. Most of the axes are three-quarters grooved, a few full grooved, and some are rather large. Three are shown in Plate XIV. The celts are all more or less similar to the one shown in Plate XIV, Number 1.

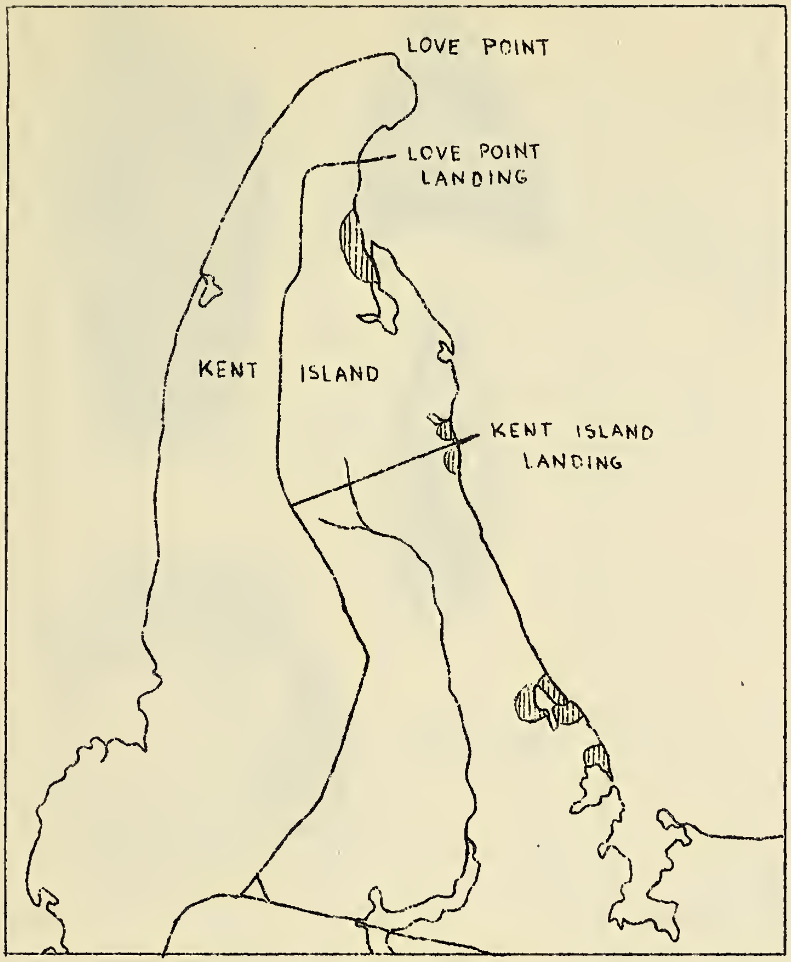
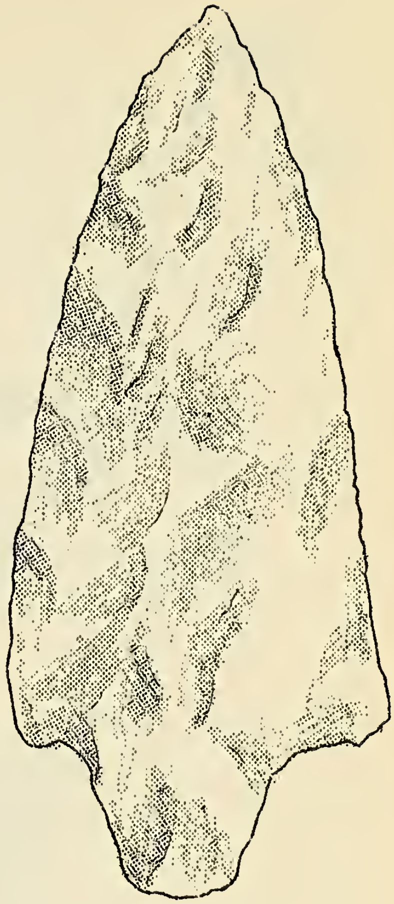


Fig. 36 ▥ SHELL DEPOSITS



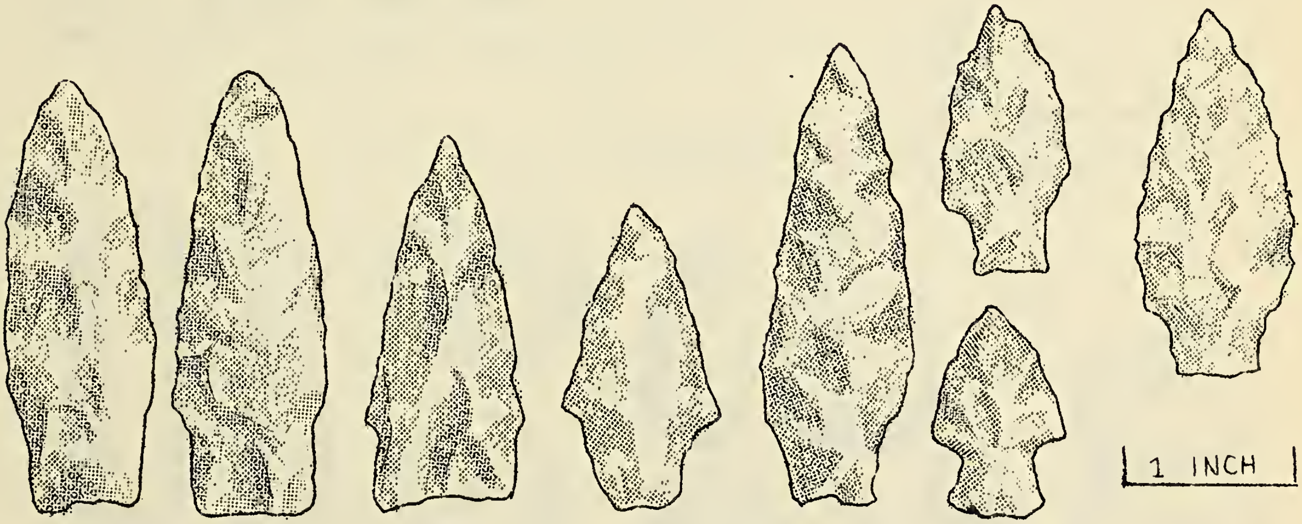


Fig. 37 CHIPPED IMPLEMENTS OF QUARTZ, QUARTZITE AND RHYOLITE
KENT ISLAND SITES

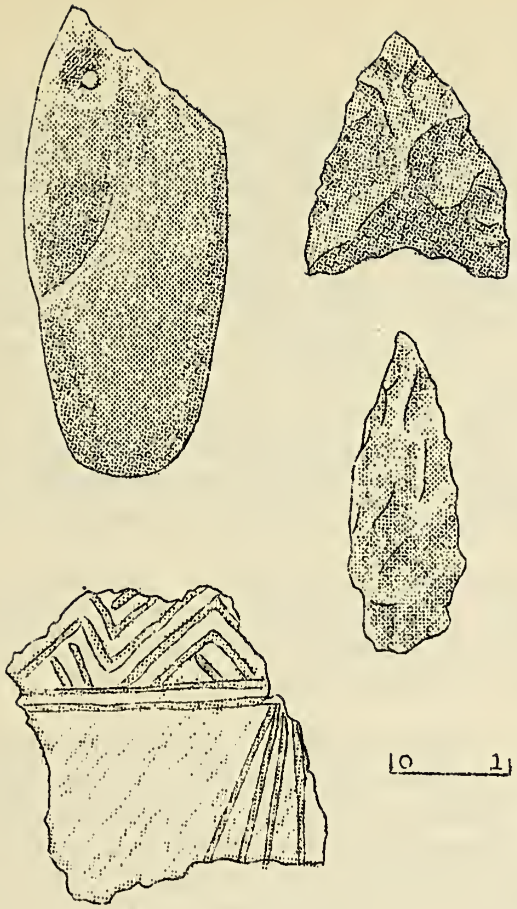


Fig. 38 ARTIFACTS FROM SMALL SHELL DEPOSIT AT SWAN CREEK

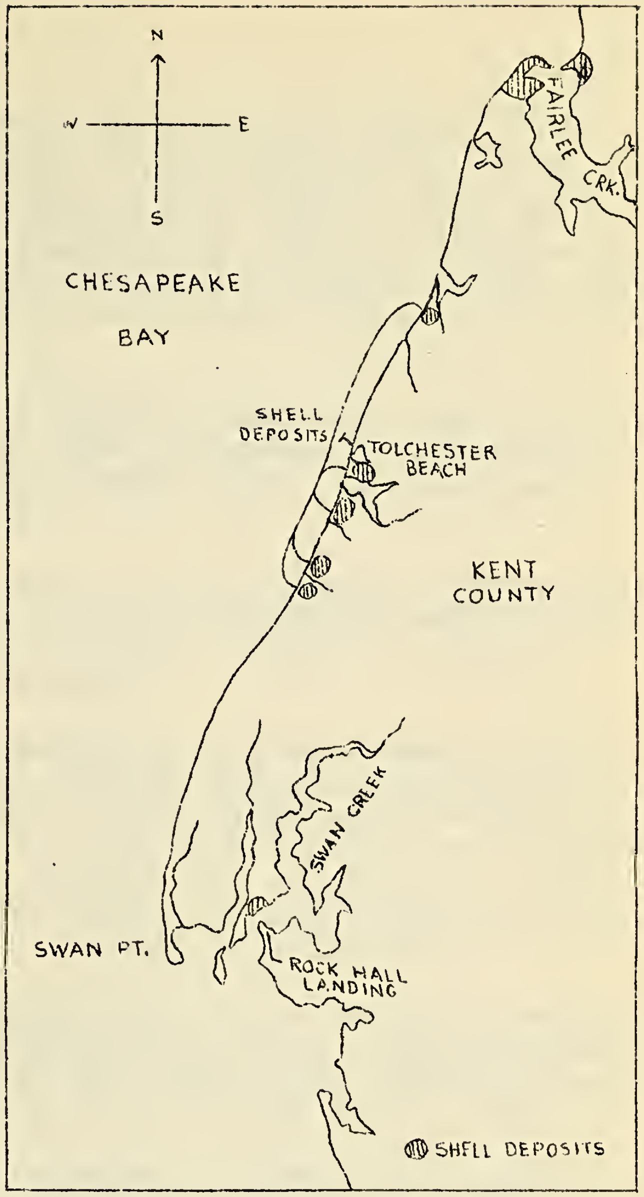


Fig. 39

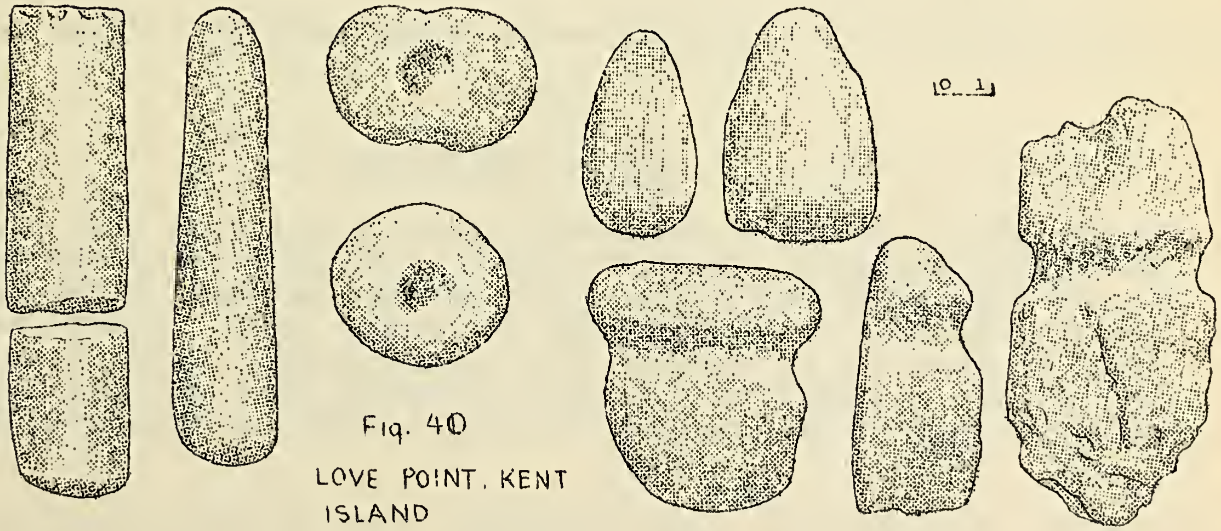


Fig. 40

LOVE POINT, KENT ISLAND

Five bannerstones have been found, of the type shown in Plate XIV, Number 5, made of grey trap rock, and one other made of red sandstone and having more pointed wings. Seven gorgets are in the collection, of which six are but fragments, and one is composed of five pieces, two pieces having been found by Mr. Marks and three by the writer. This specimen is shown in Plate XIV, Number 4, and seems to be very similar in type and material to the one found at Booby Bar, shown in Plate III, Number 4.

Among the other types of stone artifacts recovered were several broken pestles, showing polish at the ends, numerous pitted stones, several fragments of steatite cooking vessels, and the arrowshaft smoother shown in Plate XIV, Number 2.

Mr. Marks' collection contains about three hundred arrowpoints and several large spearpoints. Most of the arrowpoints are stemmed, of the types shown by drawings (Fig. 37) and are made of quartz, rhyolite, and a few specimens of quartzite.

Approximately twenty small projectile points are made of flint of a greyish-brown color, including both stemmed and triangular types. Five specimens are shown in Plate XIV. It is apparent that this flint was derived locally, since many flaked pebbles and chips were observed in the fields and on the beach where erosion has cut into the shell deposits. Flint implements of similar types and material were found at Booby Bar, Rocky Point and in the vicinity of Tolchester.

The spearpoint shown in Plate XIV, Number 3, is made of ferrous quartzite, of a dark reddish-brown color. Mr. Marks found a number of points of this type and material on the beach just south of Kent Island Landing where they had evidently been washed from a cache.

A large rhyolite spearpoint is shown by a drawing in Fig. 37. There is another in the collection an inch longer than this one.

Some additional drawings of stone artifacts are shown by Fig. 40.

*****

IX TOLCHESTER SITES

There is a series of fairly large shell deposits in the vicinity of Tolchester in Kent County. These sites are clustered around some small tidewater lakes or lagoons that are located along this stretch of the bay front. These lakes are very similar in appearance to the lake at Rock Point, having fresh water springs at the head of each one. The map, (Fig. 39) shows the position of these sites; it is to be noted that they are just south of the famous shell heap at Fairlee Creek.

From these sites we have collected three grooved axes, two celts, an ovate two hole black slate gorget and numerous arrowpoints. A broken bannerstone and some shards were also found.

The artifacts from these sites resemble very closely those found at the Kent Island sites.

*****

X SWAN CREEK SITE

This site is located on the north bank of Swan Creek, opposite Rock Hall Landing in Kent County, and consists of a small shell deposit elevated only a few feet above tidewater. Our collection from this place is not very large, but we did find about one hundred sherds. Most of the sherds bear the impressions of basketry and are tempered with shell. One has an incised design. Several are cord marked and have beach sand as tempering material.

Arrowpoints total five, three stemmed and two triangular. Two of the stemmed points are made of rhyolite, one of argillite and the triangular points are made of dark colored chert.

Two hammerstones were found, one of grey trap rock, spherical in shape, and the other, which was a small oval quartzite boulder, had abrasion marks at both ends.

A pendant made of a small ovate pebble of trap rock had two holes bored at one end.

All this material was recovered from the beach, where storms had washed out the shell. The main shell deposit was in a field that was in weeds, and although the extent of the deposit could be determined, no artifacts were observed on the surface. Some of the artifacts are illustrated by drawings, (Fig. 38).

*****

XI VILLAGE SITES OF THE MAGOTHY RIVER, ANNE ARUNDEL COUNTY

During the course of ten or twelve years we located and investigated nine sites on the shores of the Magothy River. These sites all contain shell deposits and are shown on the map (Fig. 41). The largest and most important consists of a group of shell deposits on Ulmsteads Point and on the shores of Forked Creek. The distribution of these shell deposits is shown in greater detail by another map (Fig. 45).

WEST BANK OF FORKED CREEK

This is a large shell deposit, extending the entire length of the western shore of Forked Creek. At the time we discovered this site the fields were in weeds and were never cultivated thereafter, with the exception of a small field near the southern edge of the shell deposit. Our surface collection is very small, consisting of a few sherds and arrowpoints, and a large knife or cache blade of rhyolite.

Part of the shore line faces a wide stretch of water which, whenever there is a strong northeast wind, washes away the bank of the creek and deposits shells and artifacts on the beach. A three day storm that occurred in August, 1934, washed away at least six feet of the bank and exposed a long section of the shell deposit that was very rich in artifacts.

At the point marked "A" on the map (Fig. 45), many fragments of

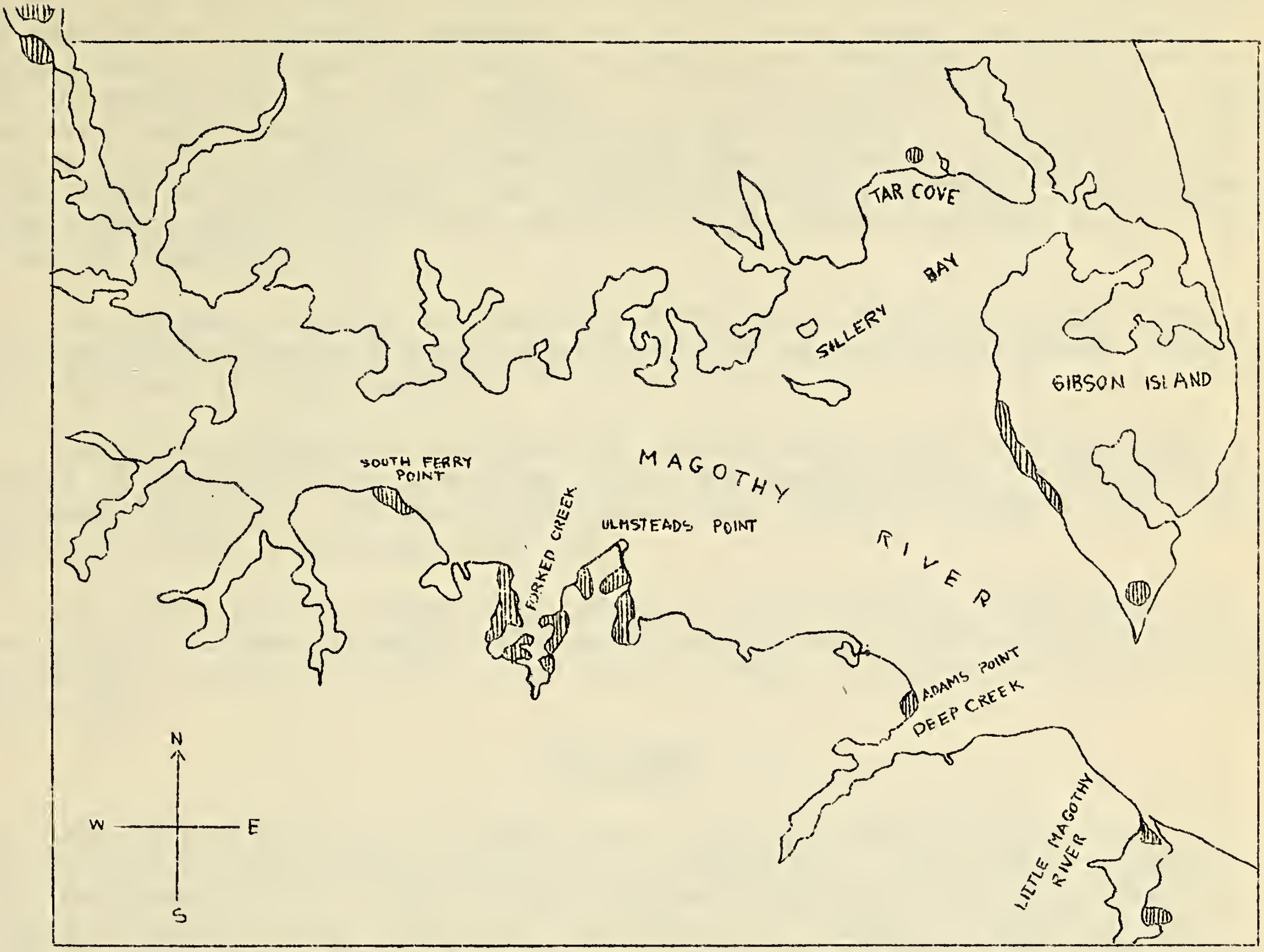


Fig. 41 INDIAN VILLAGE SITES OF THE MAGOTHY RIVER ▥ SHELL DEPOSITS

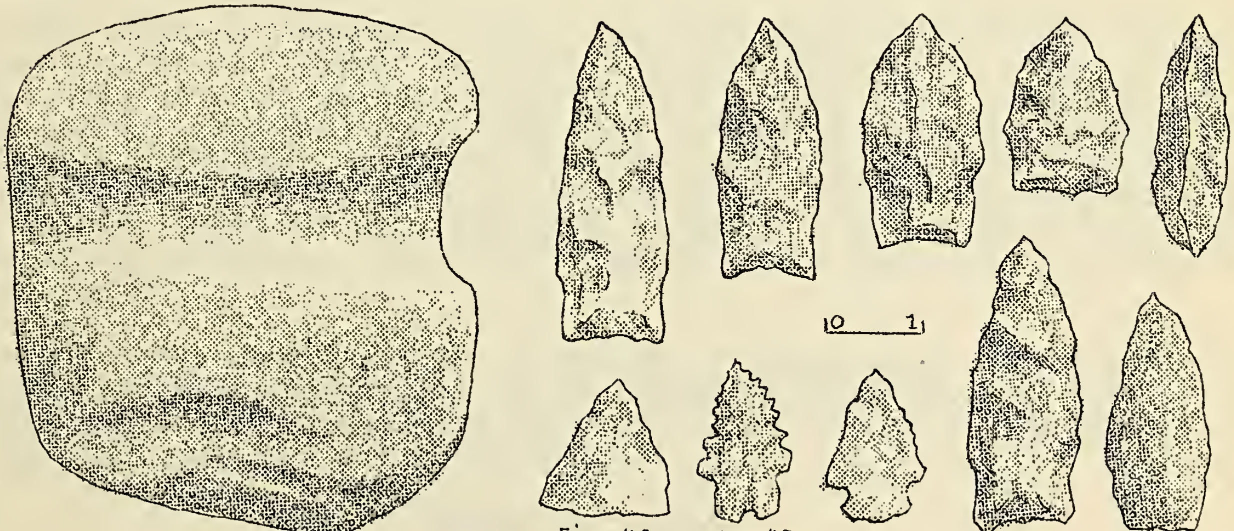


Fig 42 Fig.43 Fig44

ARTIFACTS FROM POINT OF LAND DIVIDING FORKED CREEK

a large pot were lying on the beach and some were still in place near the bottom of the shell deposit, which at this point was eighteen inches deep. In order to recover as much as possible of this pot we dug an area about ten feet square in the shell deposit and also through the sand on the beach. We found about one-third of the possible number of sherds, including those forming the bottom and parts of the side walls up to the rim. The vessel has been restored and is shown by a drawing (Fig. 47). The exterior impressions on this vessel are those of basketry.

In digging through the shell deposit in search of sherds from this vessel we found four bone awls and an antler arrowpoint. (Plate XVI, Numbers 13, 15, and 17).

Another excavation, marked "B" on the map (Fig. 45) measuring twenty by thirty feet, was made about one hundred feet to the south of excavation "A". We recovered about six hundred sherds, some arrowpoints and five bone awls from "B".

At other places along this stretch of the shore additional excavations on a small scale were made wherever the shells were found to contain cultural refuse. Altogether some two thousand sherds were recovered.

POTTERY

The majority of the sherds from this site were shell tempered and bore the impressions of cords or basketry. Over fifty percent were decorated, the design being incised, or applied with cords and a cord wrapped stick. Typical examples are shown in Plate XV and also in Plate XVI, Numbers 3 and 6. Cross sections of the two large sherds shown in Plate XV are represented by drawings (Figs. 48 and 49). Fig. 48 is a cross section of Plate XV, Number 2, and Fig. 49 of Plate XV, Number 1.

Just north of excavation "A" (Fig. 45) some two hundred sherds, representing ten or twelve vessels, had been washed out of the shell deposit. As we were able to restore some fairly large sections of these vessels and also found some basal portions, it was possible to arrive at a good idea as to their shape, which in all cases resembled very closely the vessel shown in Fig. 9 from Little Round Bay Creek. These sherds, however, are impressed with cords and contain beach sand as tempering material. They are illustrated in Plate XVI by Numbers 1, 2, 4 and 7.

Six fabric marked sherds, found at the same spot, contain crushed quartz as tempering material. A rim sherd of this type of ware is shown in Plate XVI, Number 5. This sherd has two holes punched part way through, probably for decoration.

STONE ARTIFACTS

Thirty arrowpoints consisting of both stemmed and triangular types were found on the beach and in the excavations. Triangular types numbered 30% of the total, and were made of quartz and brown jasper, while the stemmed points were made of quartz, quartzite, rhyolite, and one specimen was made of argillite. A few are illustrated in Plate XVI.

Other stone objects recovered were a broken grooved axe, a small celt, two fragments of a steatite vessel, a pitted stone, two abrading stones, and a black slate gorget. The gorget is illustrated in Plate XVI, Number 18, also one of the abrading stones, Number 19, made of red sandstone and having two grooves for smoothing arrowshafts.

ULMSTEADS POINT

This site contains seven major shell deposits, their distribution being shown on the map, (Fig. 45). Our collection from this site is all from the surface and numbers about two hundred sherds and an equal amount of stone artifacts.

The majority of the sherds are cord marked, with beach sand tempering and are undecorated. They are similar to specimens from the West Bank of Forked Creek shown in Plate XVI, Numbers 1,2,4 and 7. Several sherds are fabric marked. Plate XVII, Number 1, shows two fabric marked sherds from the same vessel, which also shows marks of combing on the interior surface. Plate XVII, Number 2, shows a rim sherd and the pointed bottom of a fabric marked vessel. Number 3 on the same plate shows a rim sherd and pointed bottom of a cord marked vessel, tempered with beach sand.

Only a few decorated sherds were recovered, the design in one instance being incised. The other two bear cord impressed decoration.

STONE ARTIFACTS

Most of the projectile points from Ulmsteads Point are stemmed; only four percent are triangular. About seventy percent of the stemmed types are made of rhyolite, twenty percent of quartz, and the remainder of jasper, quartzite and argillite. The triangular points are made of quartz and jasper. Five large rhyolite blades were found at different parts of the site. These are unnotched, with straight sides and flat bases and the two largest, which were found lying side by side, were slightly polished over the surface and on the edges. The largest measured seven and seven-eight inches long. Only one scraper was recovered made from a broken arrowpoint. As it shows no polish on the edge from scraping, it may be a short bladed knife rather than a scraper. (Plate XVII, Number 6).

Several types of chipped implements are shown in Plate XVII. Numbers 4,5, and 9 are made of brown jasper, Number 7 of argillite, Number 8 of quartzite, and the rest are made of rhyolite.

GROOVED AXES AND CELTS

We recovered from this site four grooved axes, five celts, and one grooved adz. Several of these implements are shown in Plate XVII; the grooved adz is Number 14.

GORGETS AND OTHER STONE OBJECTS

Five gorgets, all broken, were found. Several are shown in Plate XVII. Number 11 has four chevrons engraved on one side and is broken across the perforation. Number 10 is from the western shore of Gibson Island and is made of argillite, the only gorget the writer has observed from Maryland that was made of this stone.

Some pitted hammerstones and rubbing stones were found in the different shell deposits. The rubbing stones are small quartzite boulders containing one or more faceted surfaces. The faceted surfaces are not polished, nor are they as rough as the marks on a hammerstone. Mr. Spriggs, the tenant of this farm, thought they may have been used by white farmers for sharpening scythes; however the writer has found similar stones on other sites and so they may be of Indian origin.

Other grave objects recovered were a stone gorget, a [illegible] celt, two fragments of a steatite vessel, a stone [illegible], [illegible] and a black slate gorget. The gorgets are illustrated in Plate XVII, number 16, with one of the [illegible] and [illegible] and having two grooves for [illegible].

[illegible]

This site contained some [illegible] shown on the map, (Fig. 38). Our collection from this site is all from the surface and [illegible] two hundred fragments of [illegible] and [illegible] stone artifacts.

The majority of the sherds are cord marked, with [illegible] and [illegible]. They are similar to [illegible] shown in Plate XVI, numbers 1,2,3 and [illegible]. [illegible] Plate XVII, number 7, [illegible] from the same vessel, which also shows [illegible] on the interior surface. Plate XVII, number 2, shows a [illegible] pointed bottom of a [illegible] vessel. Number 3 [illegible] shows a [illegible] and pointed bottom of a cord-marked vessel, [illegible] sand.

Only a few [illegible] were recovered, [illegible]. [illegible]

STONE ARTIFACTS

Most of the projectile points from [illegible] Point [illegible] forty percent are triangular. About seventy percent of the [illegible] are made of rhyolite, twenty percent of quartz, and the [illegible] of [illegible], quartzite and argillite. The [illegible] of quartz and jasper. Five large rhyolite blades were found at different parts of the site. These are unnotched, [illegible] and flat based and the two largest, [illegible] were slightly [illegible] the [illegible] and [illegible] inches long. Only one [illegible] was made from a broken arrowpoint. As it shows no [illegible] on the [illegible], it may be a short blade [illegible]. (Plate XVII, number 9).

Several types of chipped implements are shown in Plate XVII. Numbers 4,5, and 6 are made of brown jasper, number 7 of argillite, number 8 of quartzite, and the rest are made of rhyolite.

GROOVED AXES AND CELTS

[illegible] recovered from this site [illegible] grooved axes, [illegible] celts, and [illegible]. Several of these implements are shown in Plate XVIII [illegible] number 14.

GORGETS AND OTHER STONE OBJECTS

[illegible] gorgets, [illegible], were found. Several are shown in Plate XVIII. Number 11 has [illegible] engraved on one side and [illegible] perforation. Number 12 is from the [illegible] and is made of argillite, [illegible] made of this stone.

Several pitted [illegible] hammerstones [illegible] were found in [illegible] deposits. The [illegible] stones [illegible] surfaces. [illegible]

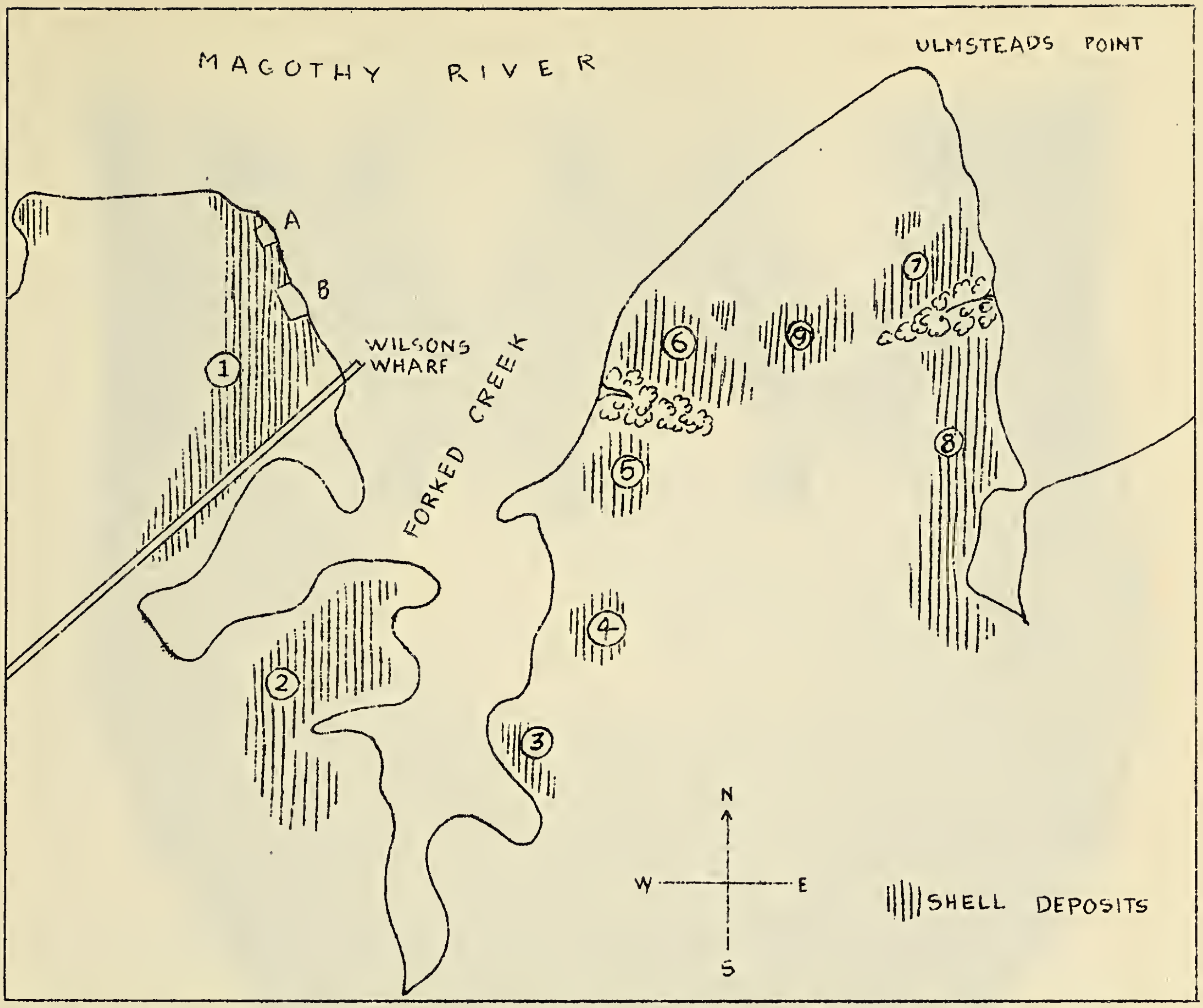


Fig. 45 EXTENT OF SHELL DEPOSITS AT FORKED CREEK AND ULMSTEADS POINT

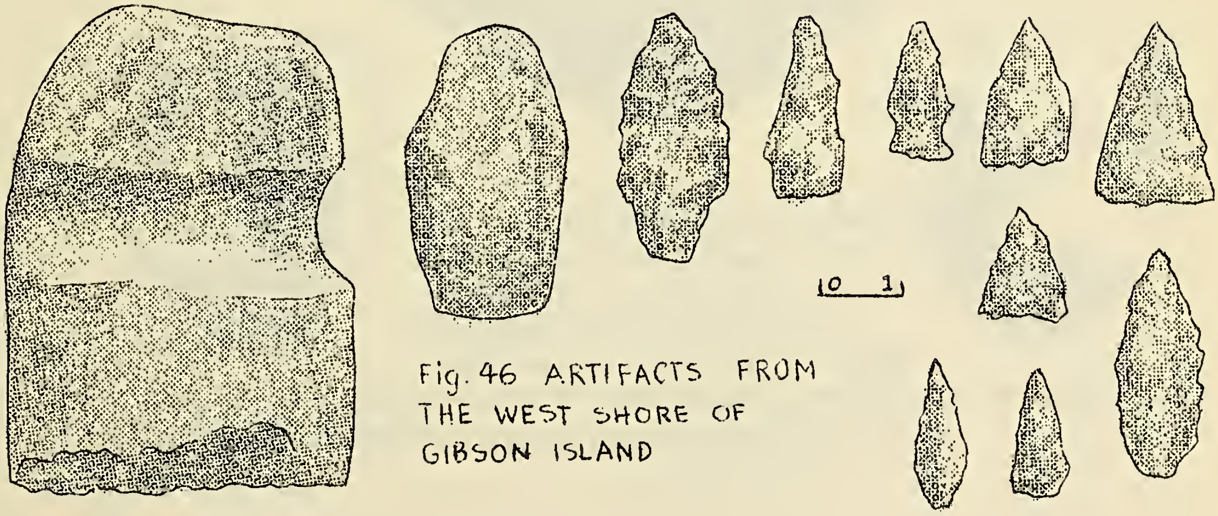


Fig. 46 ARTIFACTS FROM THE WEST SHORE OF GIBSON ISLAND

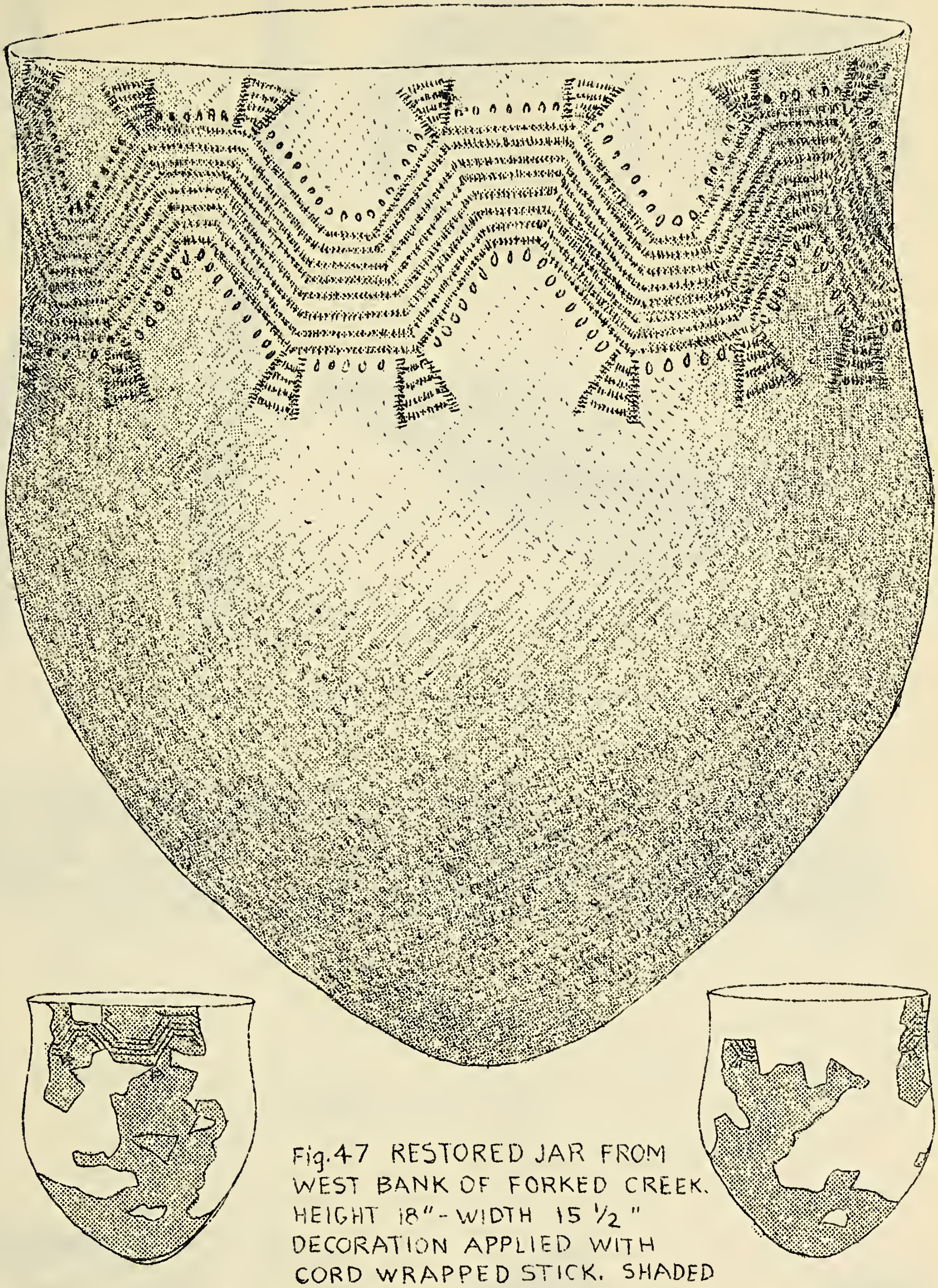


Fig. 47 RESTORED JAR FROM WEST BANK OF FORKED CREEK. HEIGHT 18" - WIDTH 15 ½" DECORATION APPLIED WITH CORD WRAPPED STICK. SHADED AREAS IN TWO SMALL DRAWINGS SHOW AMOUNT OF POTSHERDS RECOVERED, FROM WHICH THE RESTORATION WAS MADE

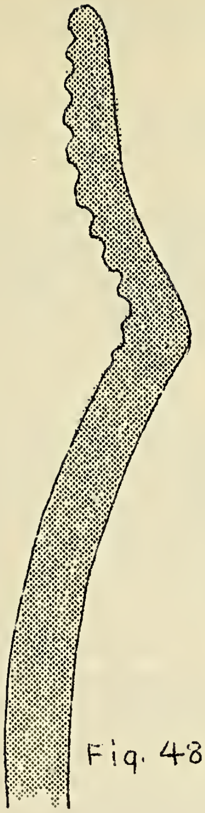


Fig. 48

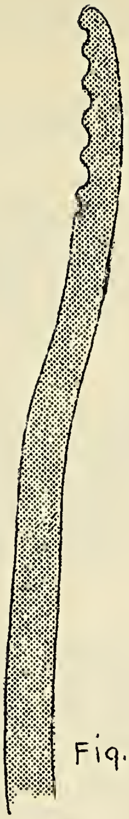


Fig. 49

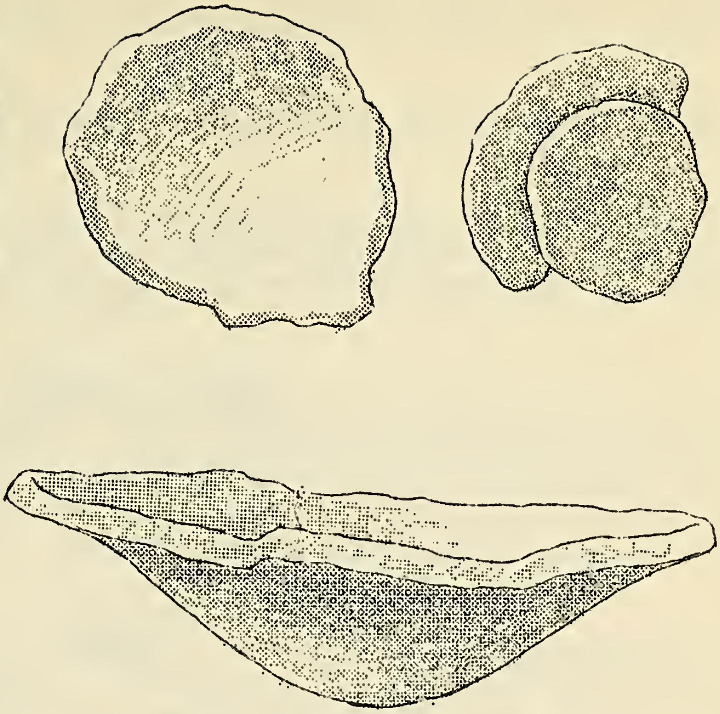


Fig. 50 BASAL PORTIONS OF POTS

WEST BANK OF FORKED CREEK

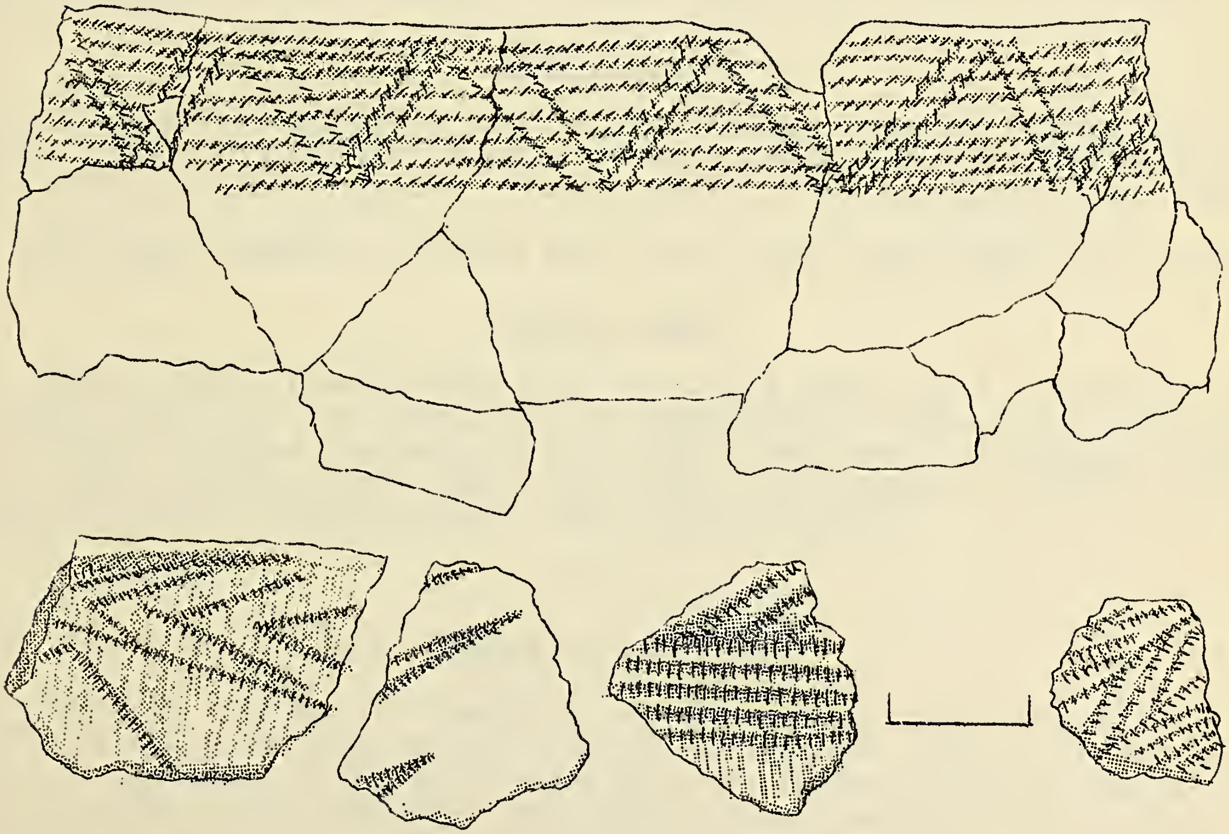


Fig. 51 SEVERN RIVER

A number of quartzite boulders were flaked on only one end and seem to be completed implements, probably used in the hand for chopping.

One small pestle was recovered, completing the list of stone objects.

No bone objects were found at Ulmsteads Point as we did not excavate there. Bone objects are only recovered through excavation, as once they are ploughed to the surface by cultivation they soon disintegrate by exposure to the elements.

HARMONY POINT

This is a local name given to the point of land dividing Forked Creek. A shell deposit covers a large part of the peninsula and was in cultivation when we first discovered the site. It is now covered with houses. From this place we found about fifty arrowpoints, some sherds, and one grooved axe. The artifacts are very similar to those from Ulmsteads Point.

TAR COVE

This site, a small shell deposit, was recently excavated by the Maryland Archaeological Society. About two hundred sherds were recovered, resembling those from the West Bank of Forked Creek. Decoration was usually applied with cords or a cord wrapped stick, and all the sherds bore exterior cord impressions, with the exception of a few that had smooth surfaces. At least three vessels had collared rims somewhat resembling the style of ware usually found on the Potomac, above tidewater. Other objects include two triangular arrowpoints, several pieces of cut antler, a small clay pipe, and a bone awl.

GIBSON ISLAND

The objects collected from Gibson Island were all found on the beach. These include two broken grooved axes, a celt, some arrowpoints and sherds and the argillite gorget shown in Plate XVII, Number 10.

All this material is very much like that from Ulmsteads Point.

OTHER SITES

Other sites shown on the map (Fig. 41) have all been visited but not much material was found, due to unfavorable collecting conditions. The sherds, chipped implements and other artifacts from these various sites do not differ from those heretofore described as coming from Ulmsteads Point, Forked Creek, and Gibson Island.

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XII SEVERN RIVER BLUFFS

There is a series of small shell deposits at the edge of the bluffs on the left bank of the Severn River just north of the highway bridge. The only artifacts recovered were sherds, approximately seventy-five coming from the most northerly in the series of deposits. Drawings of a few decorated rim sherds are shown in Fig. 51. Exterior impressions were those of cords.

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XIII PATUXENT RIVER SITES

Our exploration of the Patuxent River during the past six years has resulted in the discovery of eleven village sites. Most of these sites were discovered in 1936, when we visited the river in a cruising cat boat, examining the banks on both sides of the river. The largest and greatest number of sites were found to be on the eastern bank. Only two were noticed on the western bank, one at the south entrance of Indian Creek and the other in the vicinity of Sotterley Point. Nothing was found at either of these places as the fields were in weeds, although the extent of the shell deposits was discernible. This voyage of exploration was not very thorough and the writer feels certain that a great many sites were overlooked. Previous to this exploring cruise, two of these sites were located by members of the Natural History Society, one, at Parker's Wharf by Mr. Elra Palmer and the other, at Cocktown Creek by Mr. Gilbert Klingel.

The location of these sites is shown on the map (Fig. 52).

LEON

This site is situated just to the north of the settlement of Leon, on the eastern bank of the river, about eight miles north of Lower Marlboro. There are two very small shell deposits here, hardly more than thirty feet in diameter. Artifacts are found scattered over the fields at the edge of the river for a distance of one-half mile north of Leon.

About a hundred sherds were recovered, all cord and fabric impressed, and undecorated. Tempering material was crushed quartz and shell, although the shell has leached out in all specimens supposedly so tempered.

Stone objects include 85 stemmed and four triangular arrowpoints. Materials are rhyolite, quartz, quartzite, jasper, grey flint and one of argillite.

One celt, two grooved axes, and a wide grooved adz, with a broken cutting edge, were also recovered.

COCKTOWN CREEK

This is a small shell deposit about two acres in extent, located on the left bank of the Patuxent River at the junction of Cocktown Creek. We anchored off this place for two days in 1936 and conducted some excavations on a small scale in the shell deposit. This was the only visit we paid to this site as it is difficult to reach overland. While of small size, this site is very prolific in artifacts, and we recovered five hundred sherds, eleven arrowpoints and some bone implements.

Most of the sherds bear the impressions of basketry, though about ten percent are cord marked and a few are impressed with fabric. Tempering material consists of shell and crushed quartz. Decorative design was both incised and applied with a cord wrapped stick. A few sherds are shown in Plate XVIII, Numbers 2, 3, 4, 6, 12, 15 and 16.

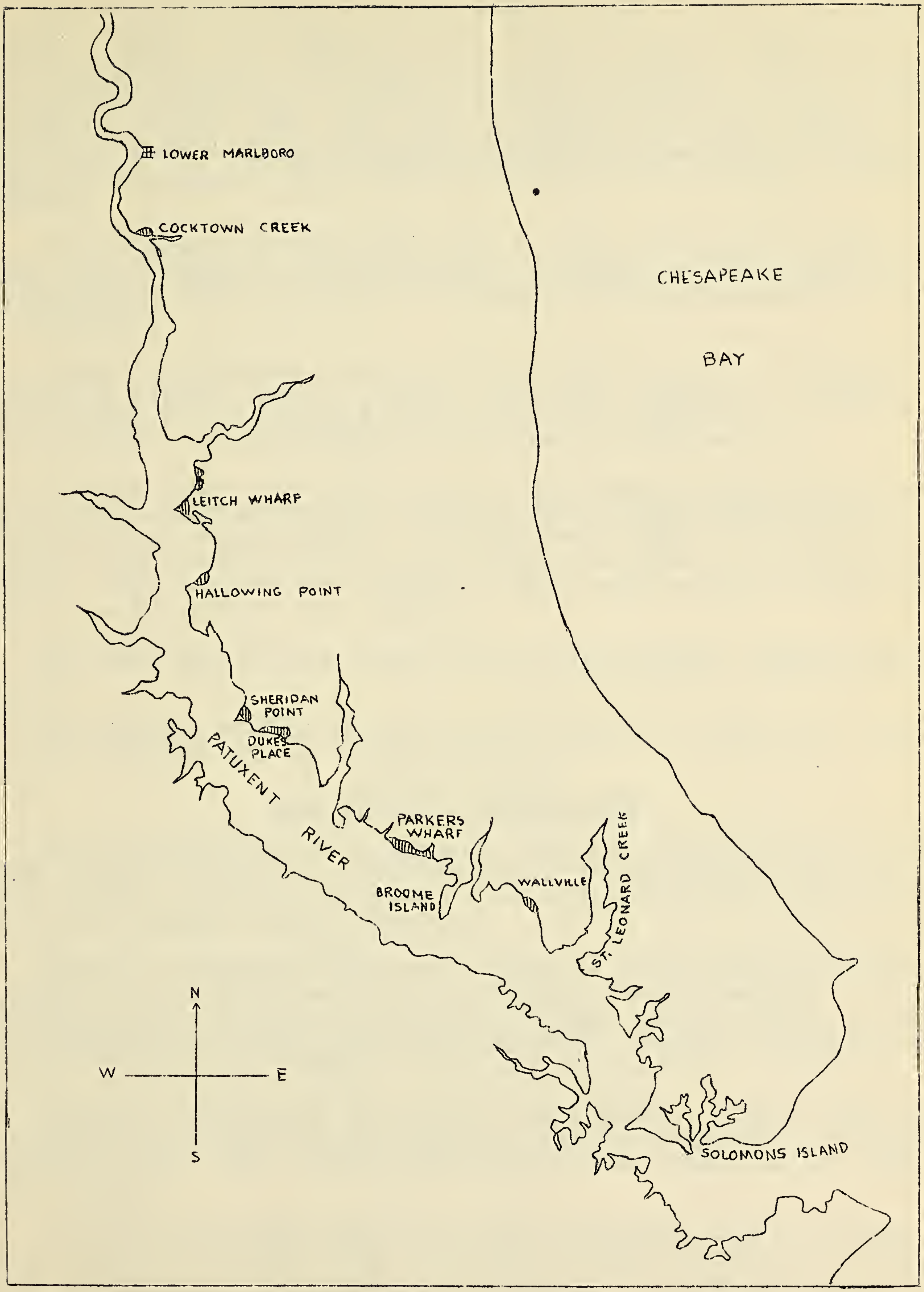

Fig. 52 PATUXENT RIVER SITES

▥ SHELL DEPOSITS

The two sherds shown in Plate XVIII, Number 2, are from a small cup-like vessel. We recovered a few additional sherds from this vessel, including the bottom section, enough pieces in fact to enable us to fairly ascertain its shape, size and decoration. This is shown by a drawing (Fig. 55). The lower triangular elements of the design touched the bottom disk, and while the drawing could not possibly be accurate due to the lack of sherds bearing the remainder of the design, the sequence of decorative elements from rim to base is probably correct.

A cord impressed lug handle from the side of a pot is shown in Plate XVIII, Number 4. This specimen is similar to one found by David I. Bushnell at the site of Pissaseck, on the Rappahannock River in Virginia.

Chipped implements number eight triangular and three stemmed projectile points, made of jasper, quartz and rhyolite. A broken cutting edge from a polished stone implement completes the list of stone objects. Some arrowpoints are shown in Fig. 54.

In excavating, some bone objects were found, including two awls made from the cannon bones of the deer and one made from an ulna. The most interesting specimen recovered was a part of a flat bone needle, broken through the eye, and apparently made from a rib of an animal. This is the only specimen of this type that the writer has found in any Maryland shell deposit.

The bone objects are illustrated in Plate XVIII, Numbers 19, 20, and 21.

Some pieces of deer antler showed evidence of having the tines cut off, probably for use as arrowpoints.

SITE NORTH OF LEITCH WHARF

This site has two shell deposits situated on both sides of a small gully or ravine, located about three-quarters of a mile north of Leitch Wharf. These shell deposits are under cultivation and our collection is chiefly from the surface.

About one hundred sherds were found, of which number half were basketry impressed, three specimens bearing incised designs. Of the remainder, forty were impressed with cord and ten with fabric. Tempering material is shell and crushed quartz. Several specimens are shown in Plate XVIII, Numbers 8, 9, 13, 14 and 17.

Nineteen arrowpoints were found, all stemmed. Sixteen were made of rhyolite, and one each of jasper, quartz and quartzite. A crude notched axe made from a small sandstone boulder completes the list of stone objects.

A section of antler, split in half lengthwise, has the broken edges ground smooth and shows the marks of hammer blows at one end. As the other end of the specimen is missing it is impossible to tell whether the implement was a chisel or a punch. Two views of this implement are shown in Plate XVIII, Number 18.

LEITCH WHARF

This is a large shell deposit located at Gods Grace Point, on the left bank of the Patuxent. This point is also the location of Leitch Wharf. The shell deposit extends for four hundred yards along the base of the point, facing a small pond enclosed by a marsh. The shell deposit is under cultivation and our collection is partly from the surface and partly from the edge of the deposit where it faces the river, the bank at this point being subject to considerable erosion.

About five hundred sherds were recovered. Nearly all bear the impressions of basketry or cords, about in equal proportions. A few were fabric impressed. Decorative design when present was incised. Tempering material consists of crushed quartz and shell.

Chipped arrowpoints consist of fifteen stemmed and four triangular specimens.

The materials are quartz, quartzite, rhyolite and jasper. Two scrapers and a large triangular blade of jasper are additional chipped implements. A small celt, a fragment from a grooved axe and a large sherd from a steatite vessel bearing a handle complete the list of stone objects. Some of these speciments are shown by drawings (Fig. 54).

HALLOWING POINT

This shell deposit is situated on a bluff facing the river, about two hundred yards north of the ferry landing opposite the town of Benedict. We did not examine this site as a farm house and out buildings occupy the entire shell deposit.

SHERIDAN POINT

This is a large shell deposit situated on the higher ground at the base of Sheridan Point. Our collection from this place is small as the land was put in pasturage after our second visit.

We managed to find sixty sherds, the majority bearing the impressions of cords and basketry. Only two were impressed with fabric. One sherd has an incised design, (Plate XVIII, Number 11). A cord impressed shell tempered rim sherd is shown in Plate XVIII, Number 7.

One large rhyolite blade and five arrowpoints were found. Two points are stemmed and made of rhyolite, and a narrow stemmed point is made of argillite. The two triangular points are made of jasper and rhyolite. They are shown by drawings, (Fig. 54). A broken celt and a steatite sherd were also recovered.

DUKE'S PLACE

There are two shell deposits located on the farm of the late Alexander Duke, situated about one-half mile south of Sheridan Point. One lies alongside and to the east of the farm house and the other is on a high bluff facing the river and about two hundred yards north of the house. We visited this site only once; consequently our collection is very meagre, consisting of twenty-seven sherds and two arrowpoints.

Both arrowpoints are stemmed and made of a grey green colored jasper and quartz.

Twenty-three sherds are impressed with cords, one with fabric and three with basketry; one of the last mentioned bears an incised design.

PARKER'S WHARF

This site consists of a series of shell deposits at Parker's Wharf, on the left bank of the Patuxent, just north of Broomes Island. These deposits extend along the river for a distance of one-half mile and to the writer's knowledge, constitute the largest site on the Patuxent.

Our collection of sherds numbers three hundred. Approximately ninety-five percent bear the impressions of basketry, and decorative designs, when present, were incised. Five percent are cord impressed; only one fabric marked sherd was found. Tempering material in all specimens is shell.

Just to the south of the wharf, a large group of sherds was discovered in a part of the shell deposit that is situated at high tide level. These were carefully removed from the deposit and partially restored, forming the large decorated rim section shown in Plate XVIII, Number 1.

This section of pottery is larger than the scale shown on the plate, as it had to be reduced to save space. It measures nine inches in width. We found additional sherds that fit on the lower part and also some that fit to the right side, containing three panels of the design. These last panels contain vertical lines rather than short dashes, and are not included in the cut so as to save space. The number of rim sherds recovered consists of approximately one-half the circumference of the vessel, and a drawing has been made to show, as near as possible, what the vessel looked like. (Fig. 53).

Two other sherds are featured in Plate XVIII, Numbers 5 and 10.

Chipped arrowpoints number seventeen. Five are triangular, eleven are stemmed, and one has a round base. Materials are rhyolite, quartz, jasper and three of the stemmed points are made of argillite. Several small scrapers were found, all made of jasper. The brown jasper used at this and other sites on the Patuxent River, seems to have a local origin, as a number of chipped pebbles and flakes were noted, far in excess of finished articles.

Other stone objects found include two broken celts, two gorget fragments and a steatite sherd. Some of the arrowpoints and scrapers are shown by drawings (Fig. 54).

WALLVILLE

This shell deposit is situated near Wallville, to the south of Broomes Island. On our first and only visit to this site we found only one specimen, an object which the writer at first thought was a broken bannerstone, but which he now believes to be a fragment of a

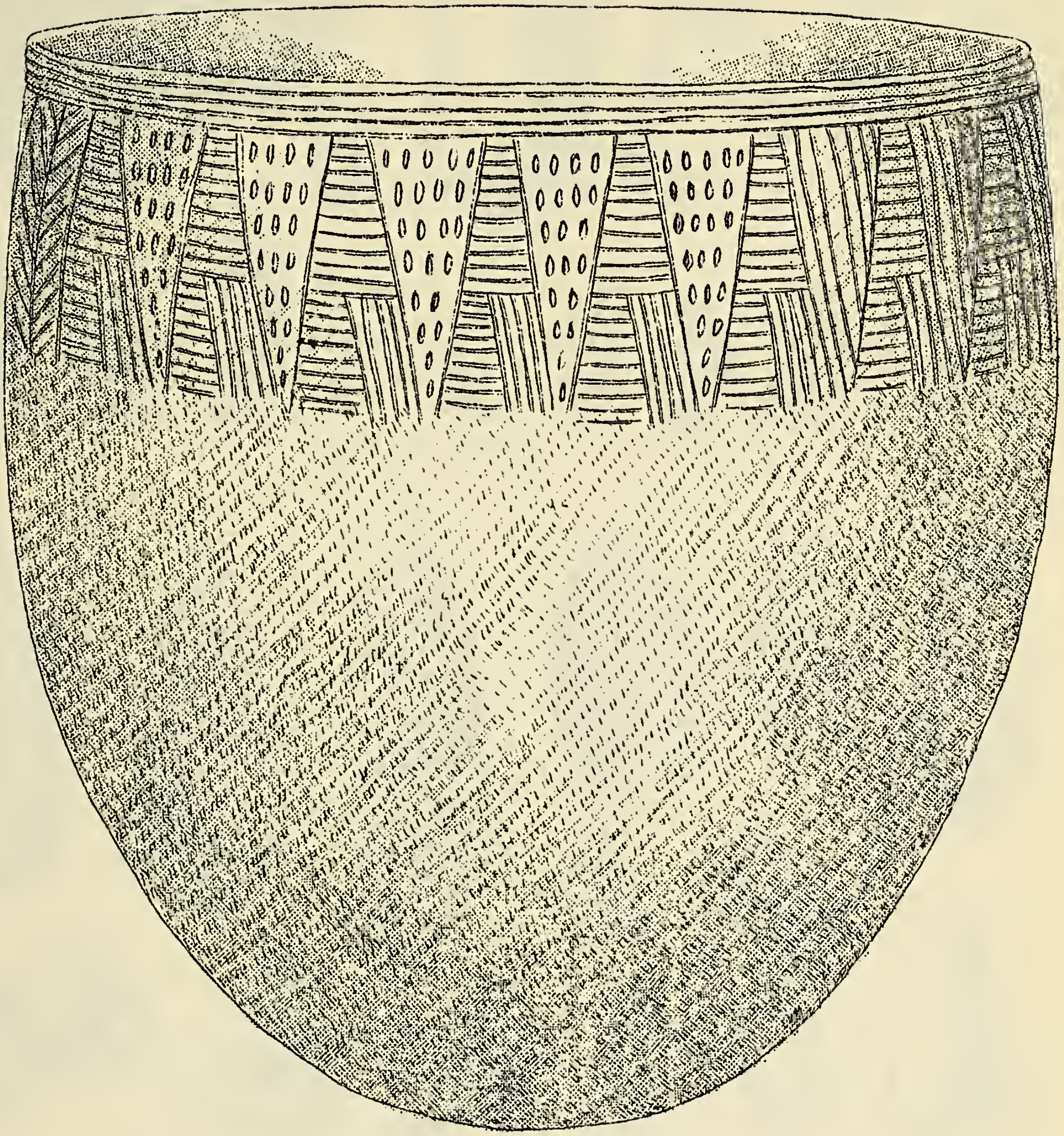

Fig. 53 DECORATIVE DESIGN AND PROBABLE SHAPE OF VESSEL FROM PARKER'S WHARF, PATUXENT RIVER, BASED ON RESTORED GROUP OF SHERDS FOUND CRUSHED IN SHELL DEPOSIT. PART OF RESTORATION SHOWN IN PLATE XVIII No. 1 DIAMETER AT RIM ABOUT 12". BASE WAS NOT RECOVERED

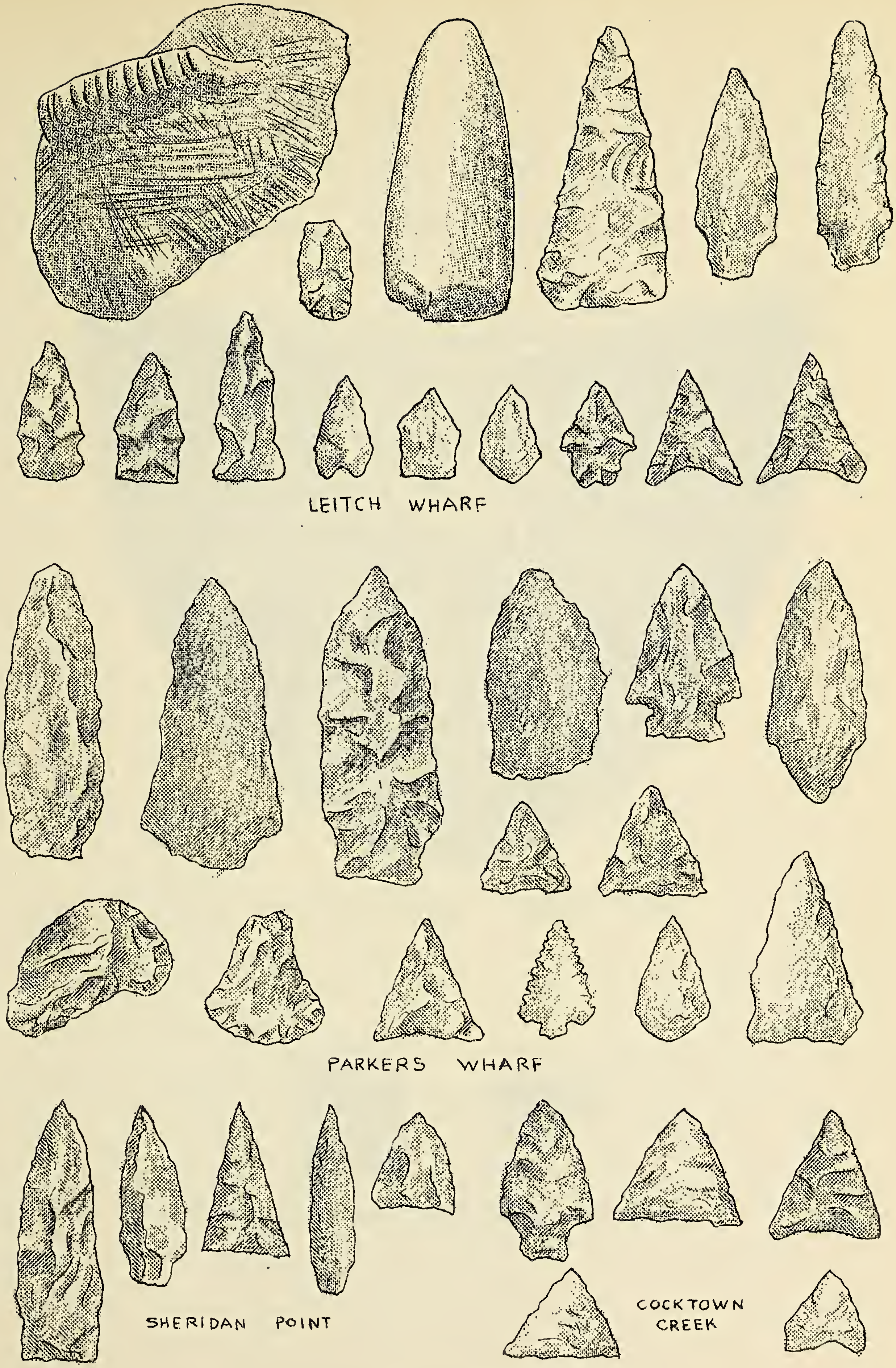

Fig. 54 PATUXENT RIVER SITES

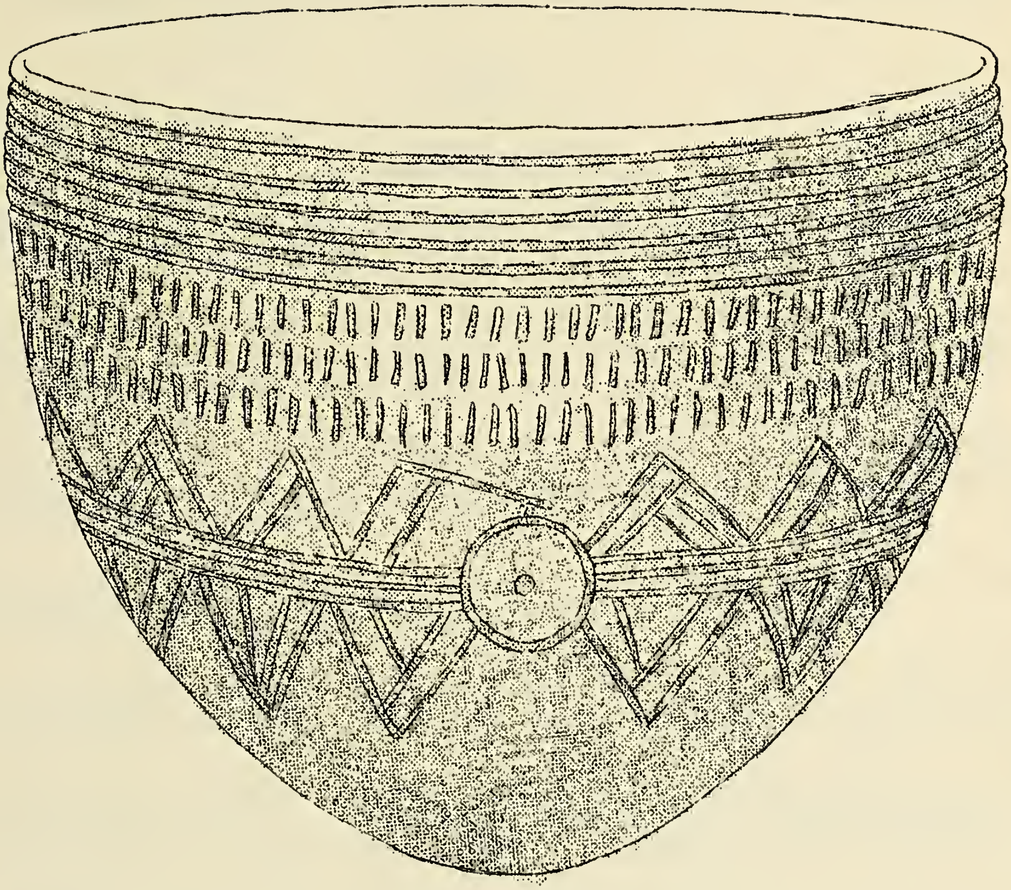

Fig. 55 COCKTOWN CREEK - ACTUAL SIZE

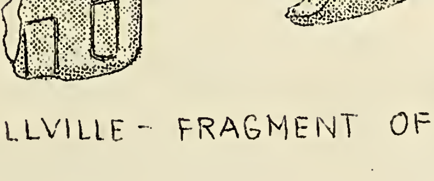

Fig. 56 - WALLVILLE - FRAGMENT OF PIPE

stone pipestem. It is made of a brownish stone with a very gritty texture, somewhat like sandstone. The specimen is shown by a drawing (Fig. 56). The design occurs on one side only. This type of design is frequently found in the Shenandoah Valley, and in the collection of Mr. Carlton Finter, of Stanley, Virginia, are a number of pipes and a gorget engraved with the same types of rectangular designs.

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CONCLUSIONS

A comparison of the ceramic and other remains from the sites described in this Proceeding reveal some interesting facts.

It seems that sherds which bear surface impressions of woven fabrics, are not as a rule, decorated, except for notches applied at the rim of the vessel, and this only occasionally.

Sherds that bear decorative designs applied with cords or a cord wrapped stick, generally have the surface impressed with cords, occasionally with basketry.

Sherds that bear incised decorative designs generally have surface impressions of basketry, occasionally of cords.

Sherds having surface impressions of cords, and containing beach sand as tempering material, bear no decorative design whatsoever.

It will be noted that these various types of ware are not evenly distributed on all sites. In fact, some sites produce such large proportions of one or more types as to almost exclude others.

Clay pipes seem to occur more frequently on sites that produce decorated pottery.

A larger proportion of triangular arrowpoints are also found on sites that produce decorated pottery. These points are usually made of quartz and jasper.

Other types of stone objects seem to be more evenly distributed on all sites. This includes grooved axes and celts, gorgets, steatite vessels, pestles, pitted and unpitted hammerstones and abrading stones.

Argillite is not a stone native to the state of Maryland. Nevertheless, chipped implements of this material have a wide range, being found more frequently on sites which produce decorated pottery. The proportion of chipped implements made of argillite as compared to those made of other materials is about one or two percent of the total.

The location of all the sites described in this Proceeding is shown on the map of the upper Chesapeake Bay (Fig. 57), indicated by numbers enclosed in a circle. They are as follows:

1 - Conowingo
2 - Site at the Crossing of the New Philadelphia Road and the
    Little Gunpowder River

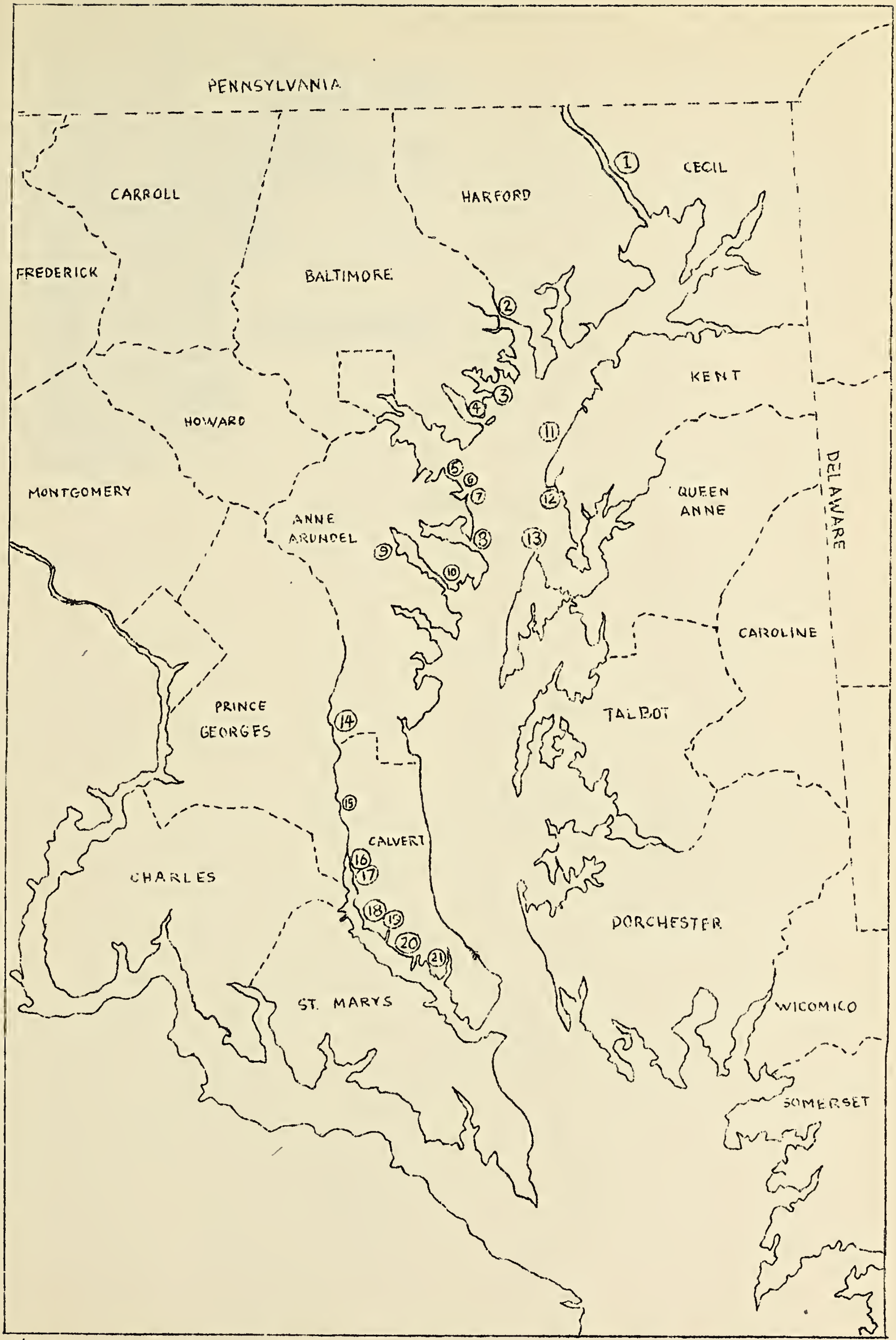

Fig 57 INDIAN VILLAGE SITES IN THE CHESAPEAKE TIDEWATER REGIONS OF MARYLAND

3 - Booby Bar Site
4 - Rocky Point Site
5 - Fort Smallwood Site
6 - North Shore of Bodkin Creek
7 - South Shore of Bodkin Creek
8 - Magothy River Sites
9 - Little Round Bay Creek Site
10 - Severn River Bluffs
11 - Tolchester Sites
12 - Swan Creek Site
13 - Kent Island Sites
14 - Site at Leon
15 - Cocktown Creek
16 - Site North of Leitch Wharf
17 - Leitch Wharf
18 - Sheridan Point
19 - Duke's Place
20 - Parker's Wharf
21 - Wallville

*****

BIBLIOGRAPHY

Bushnell, David I. - Indian sites below the falls of the Rappahannock, Virginia.

Cross, Dorothy - Archaeology of New Jersey.

Davidson, D. S. - Bulletin of the Archaeological Society of Delaware, Vol. 2, No. 2.

Graham, Wm. J. - The Indians of Port Tobacco River, Maryland and their Burial places.

Holmes, W. H. - 20th Annual Report of the Bureau of Ethnology - Aboriginal Pottery of Eastern United States 1898-99.

Marye, Wm. B. - Report of the Susquehanna River Expedition - Shell heaps on the Chesapeake Bay - 1938 Andover Press.

Weslager, C. A. - Bulletin Archeological Society of Delaware, Vol. 13, No. 2. Paper No. 1, The Coastal Aspect of Woodland Pattern as represented in Delaware.

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Errata and Addenda

Page 13, paragraph 2 - to the last sentence should be added - "except in one instance", as animal bones were found in refuse pits in area (A) referred to on page 14.

Page 21, under heading of Pottery, paragraph 1, sentence 2 should read - " Over 50% of the vessels were decorated."

Depth of Shell Deposits

The aboriginal shell deposits of Maryland average about one foot in depth and seldom exceed two feet. The leveling effect of cultivation is no doubt responsible for the shallowness of some deposits; however, others appear never to have been very thick at the time of their deposition. Two notable exceptions are the mounds at Popes Creek and Fairlee Creek. The mound at Popes Creek was about 20 feet in depth, but was burned for lime some years ago. The Fairlee Creek deposit is still more or less intact and in places is 5 feet in depth.

J. D. Ducatel, who was geologist for the State of Maryland in 1835, states that it was the custom of the day to spread shell from Indian mounds over the fields for fertilizer. He mentions this use put to a shell mound (or shell bank as it was called, at that time) on the plantation of Major Sothoron, located on the south shore of Indian Creek in the Patuxent River, and that other shell banks on the Patuxent River were also used for this purpose.

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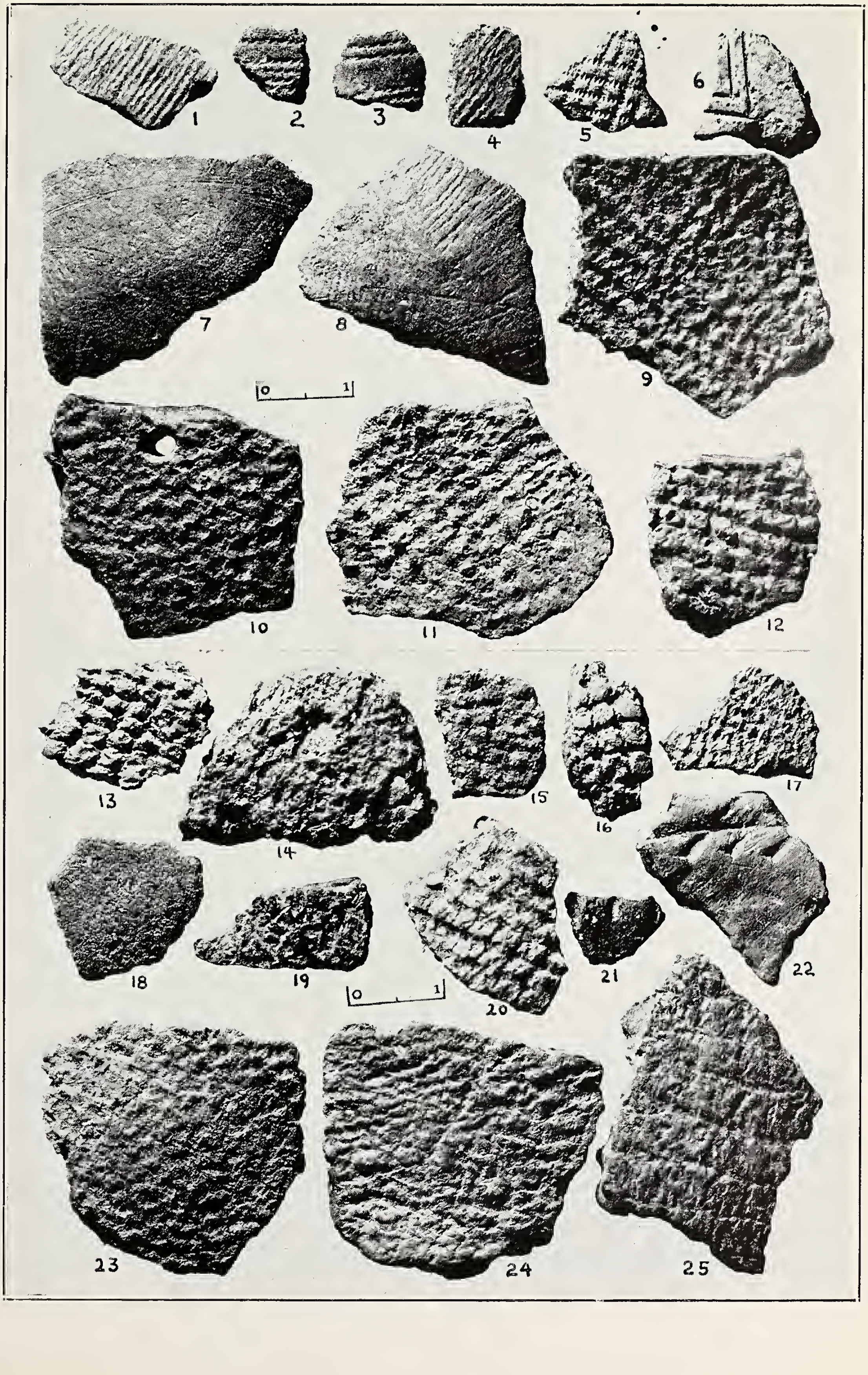
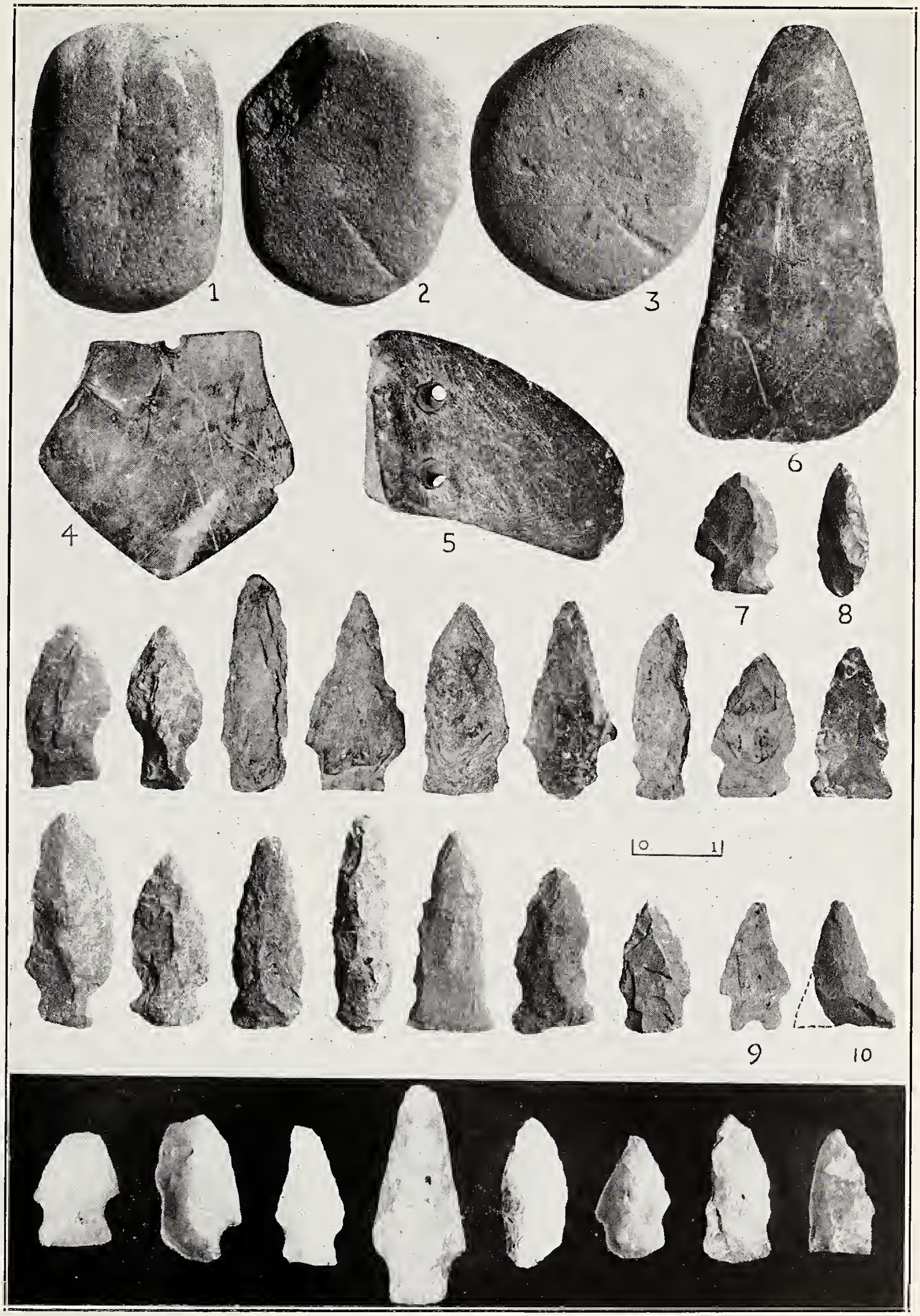
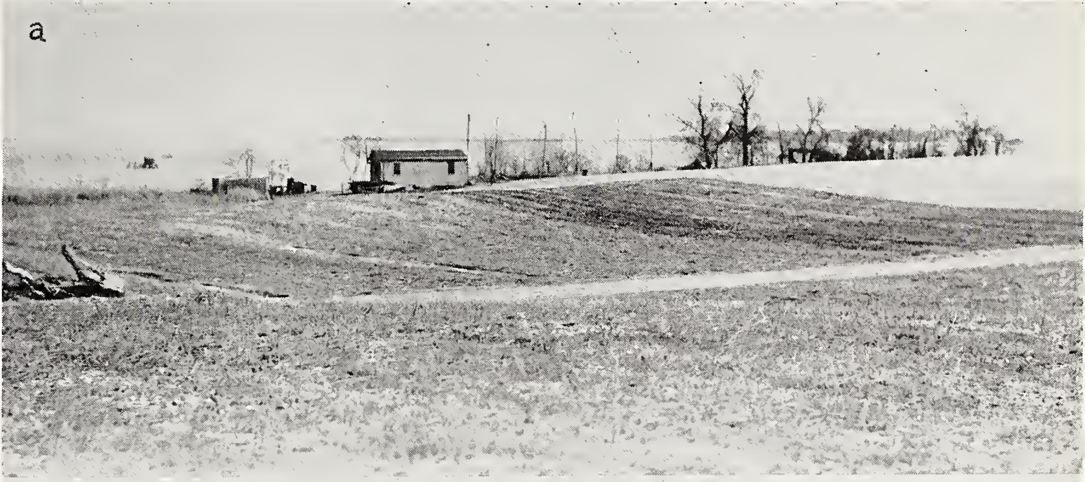
BOOBY BAR SITE PLATE I

BOOBY BAR SITE PLATE II



BOOBY BAR SITE PLATE III

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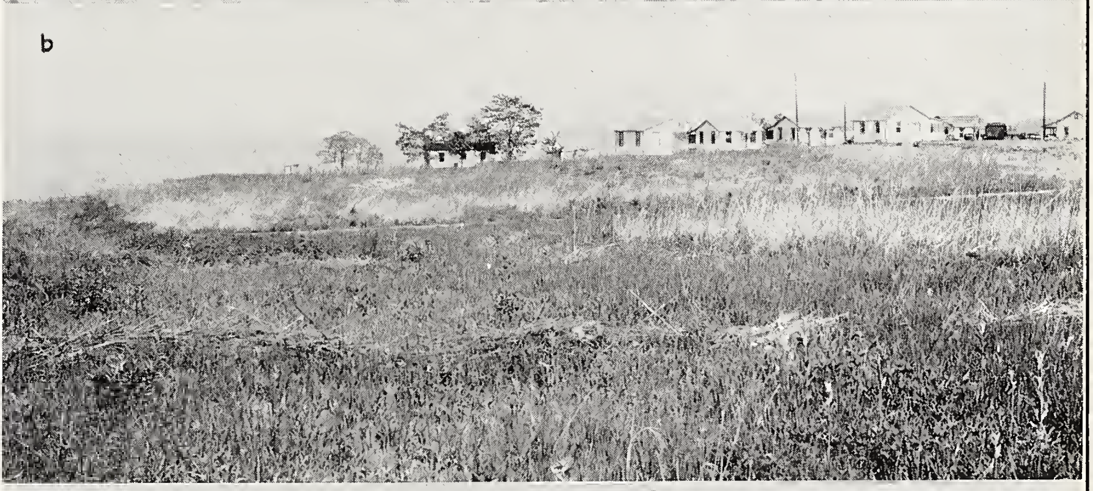
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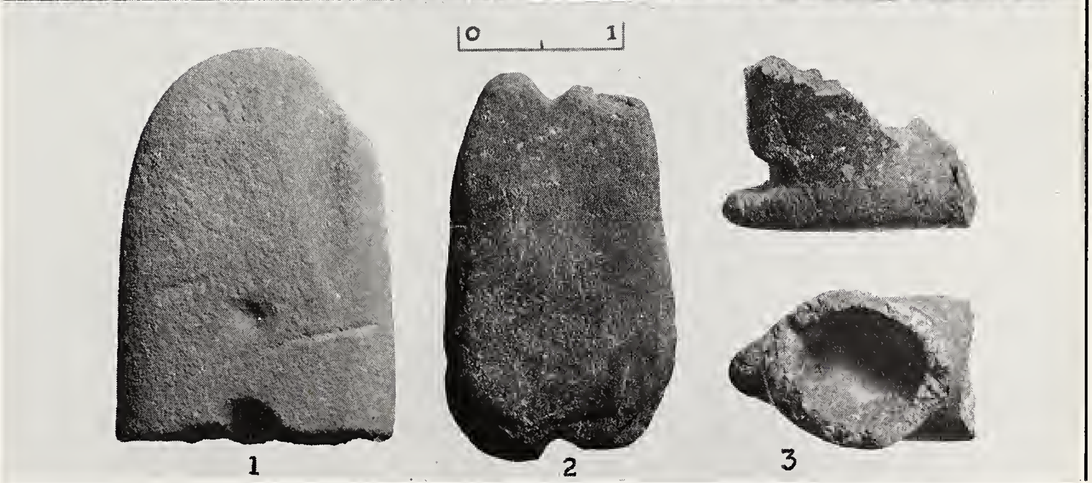
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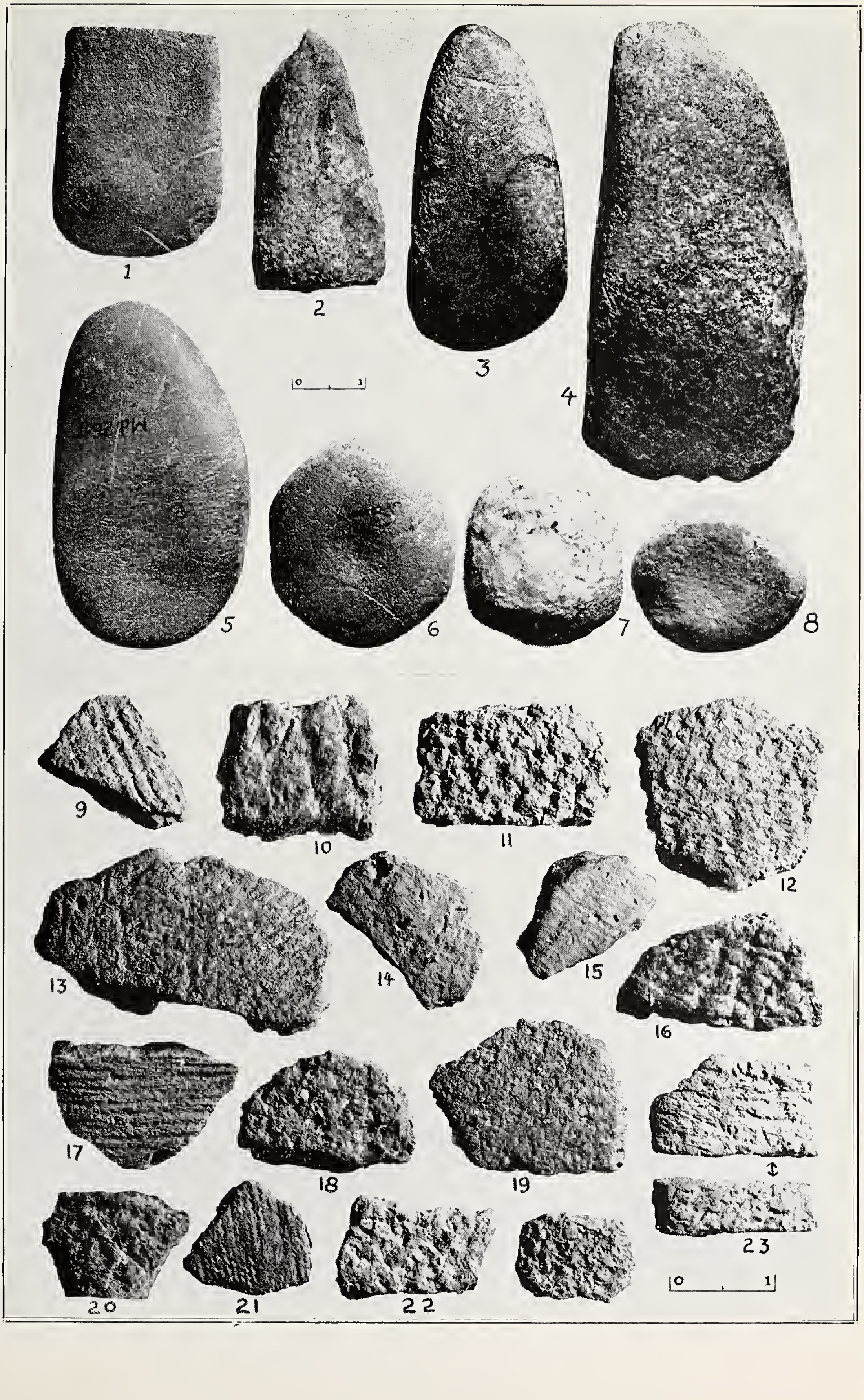
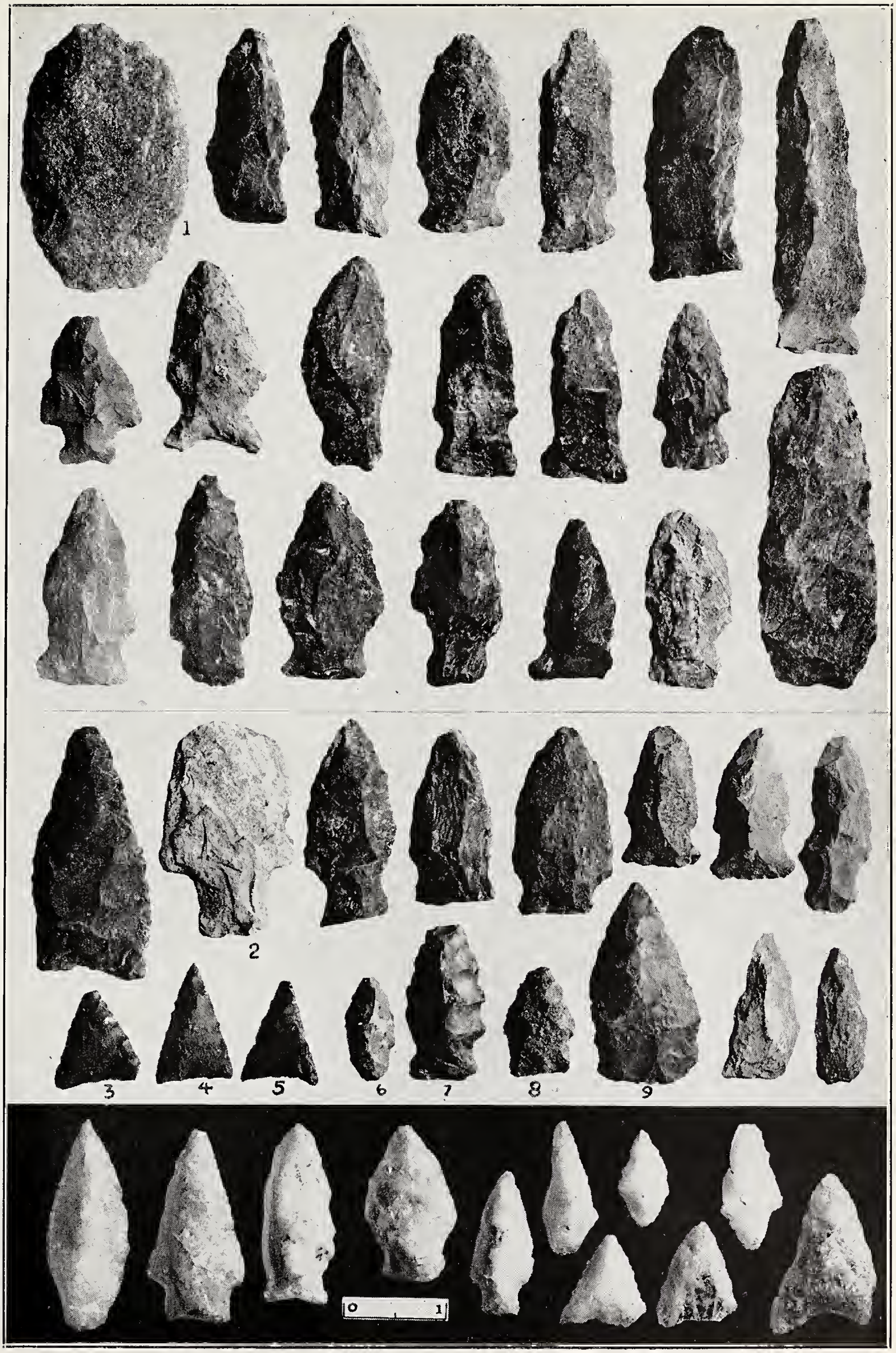
ROCKY POINT SITE PLATE V

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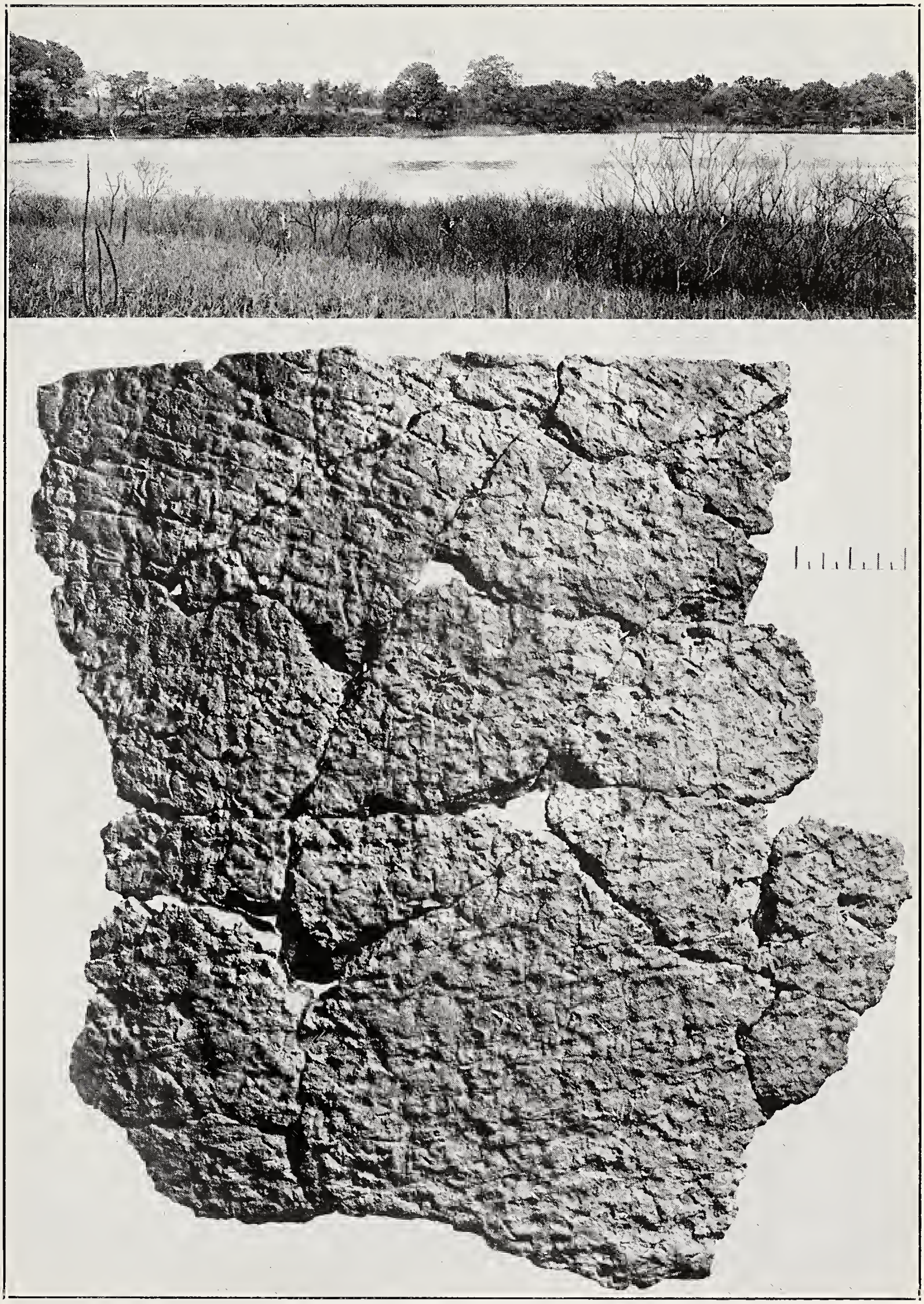
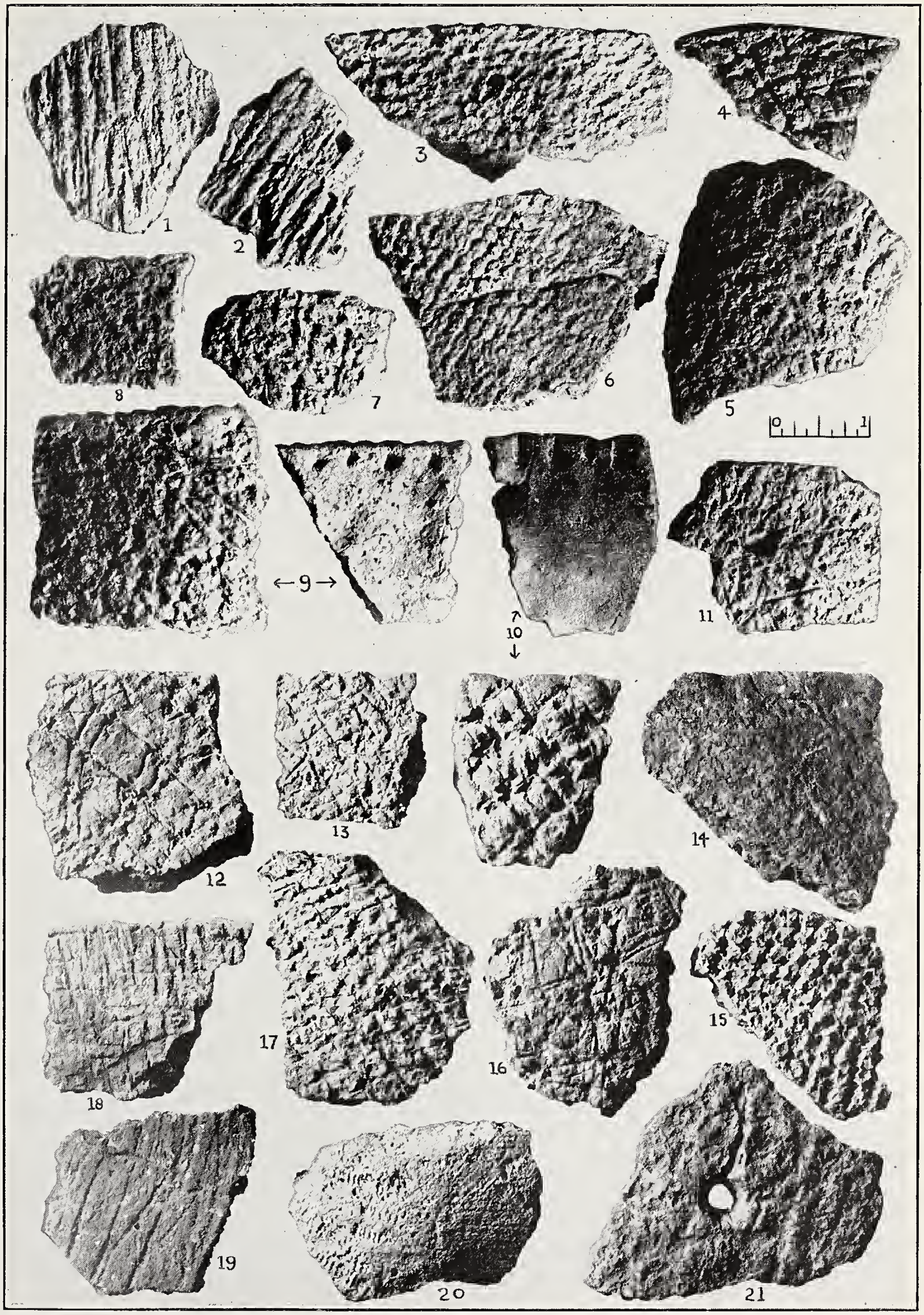
FORT SMALLWOOD SITE, ROCK CREEK PLATE VII



FORT SMALLWOOD SITE, ROCK CREEK PLATE VIII



FORT SMALLWOOD SITE, ROCK CREEK PLATE IX

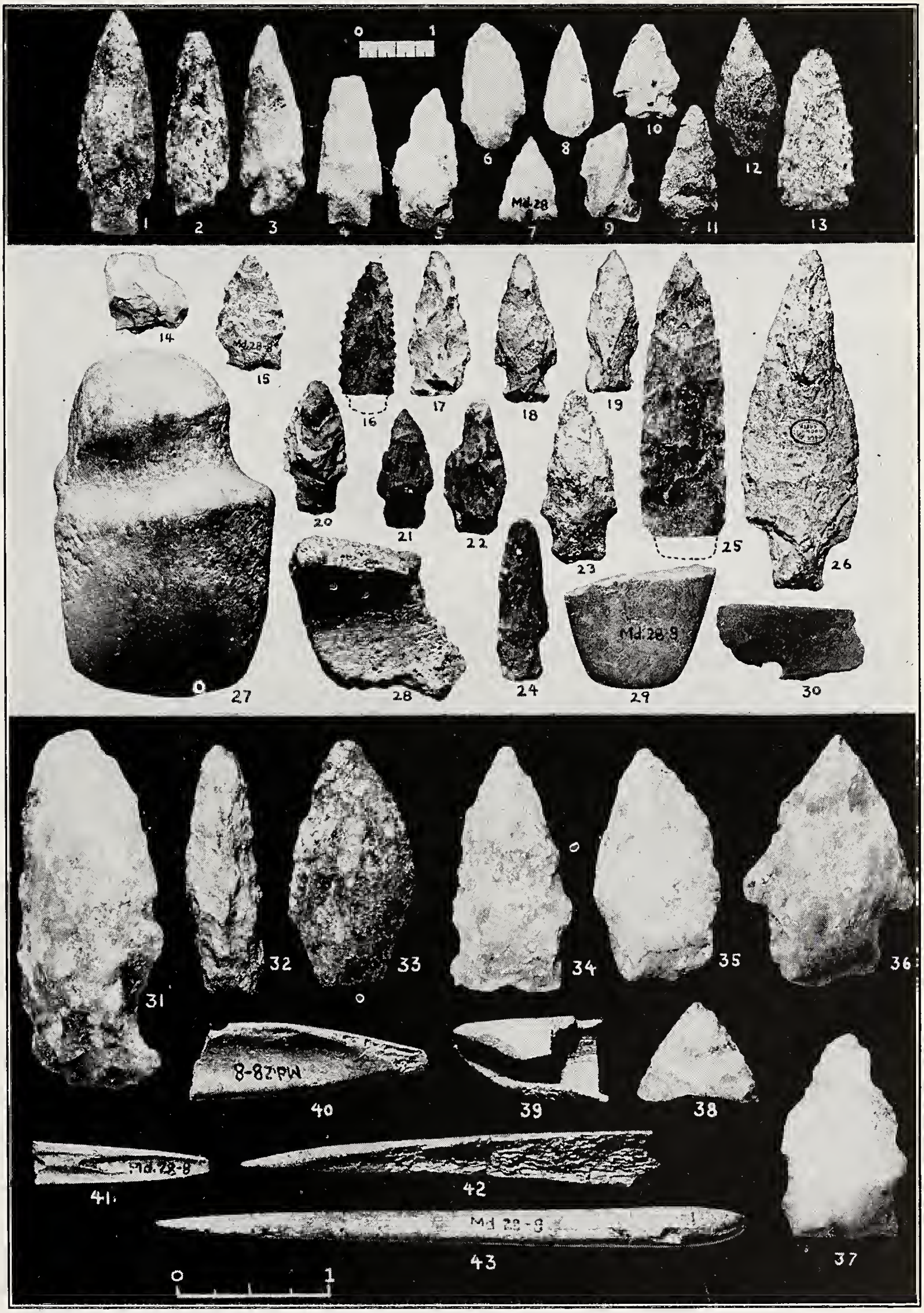
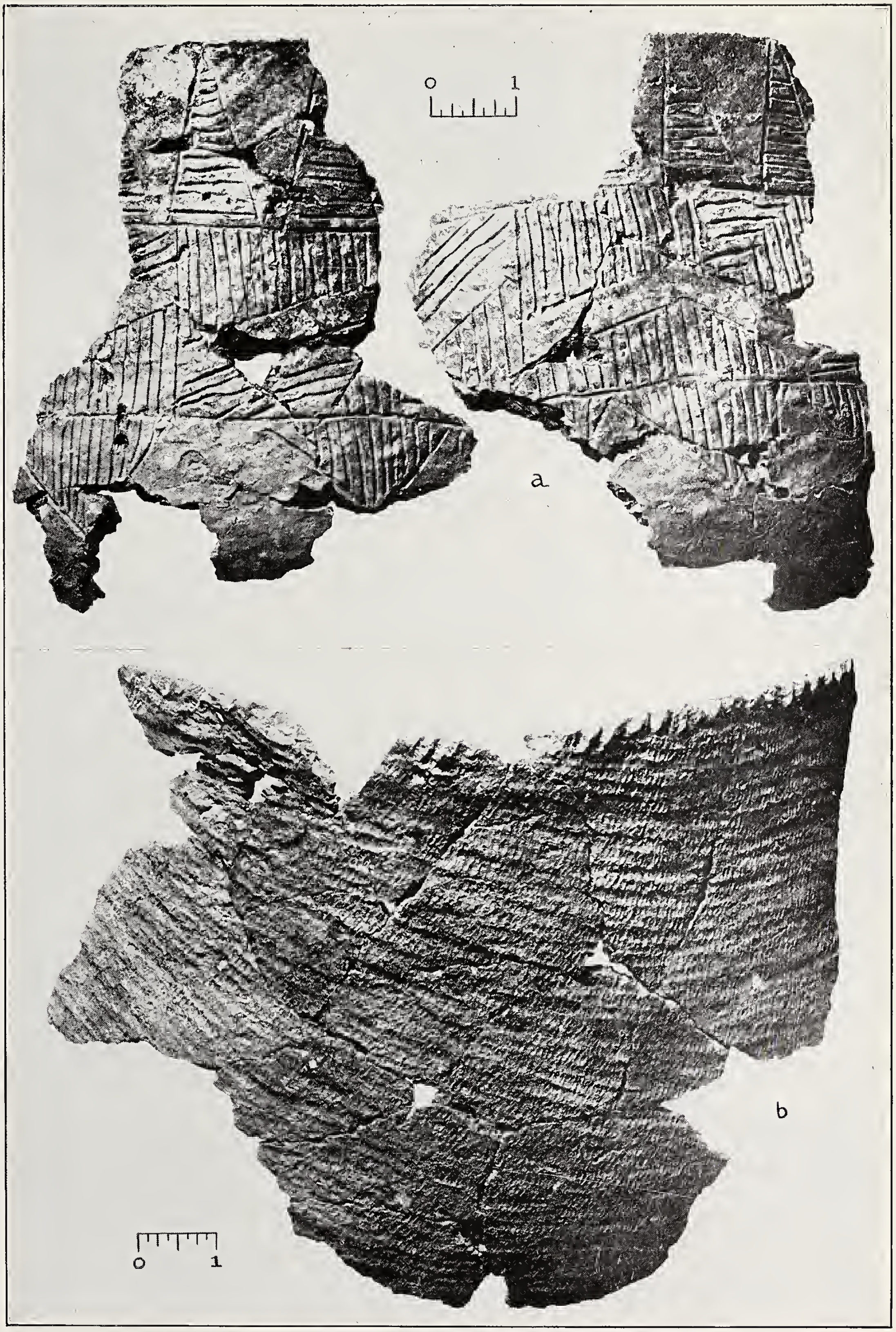
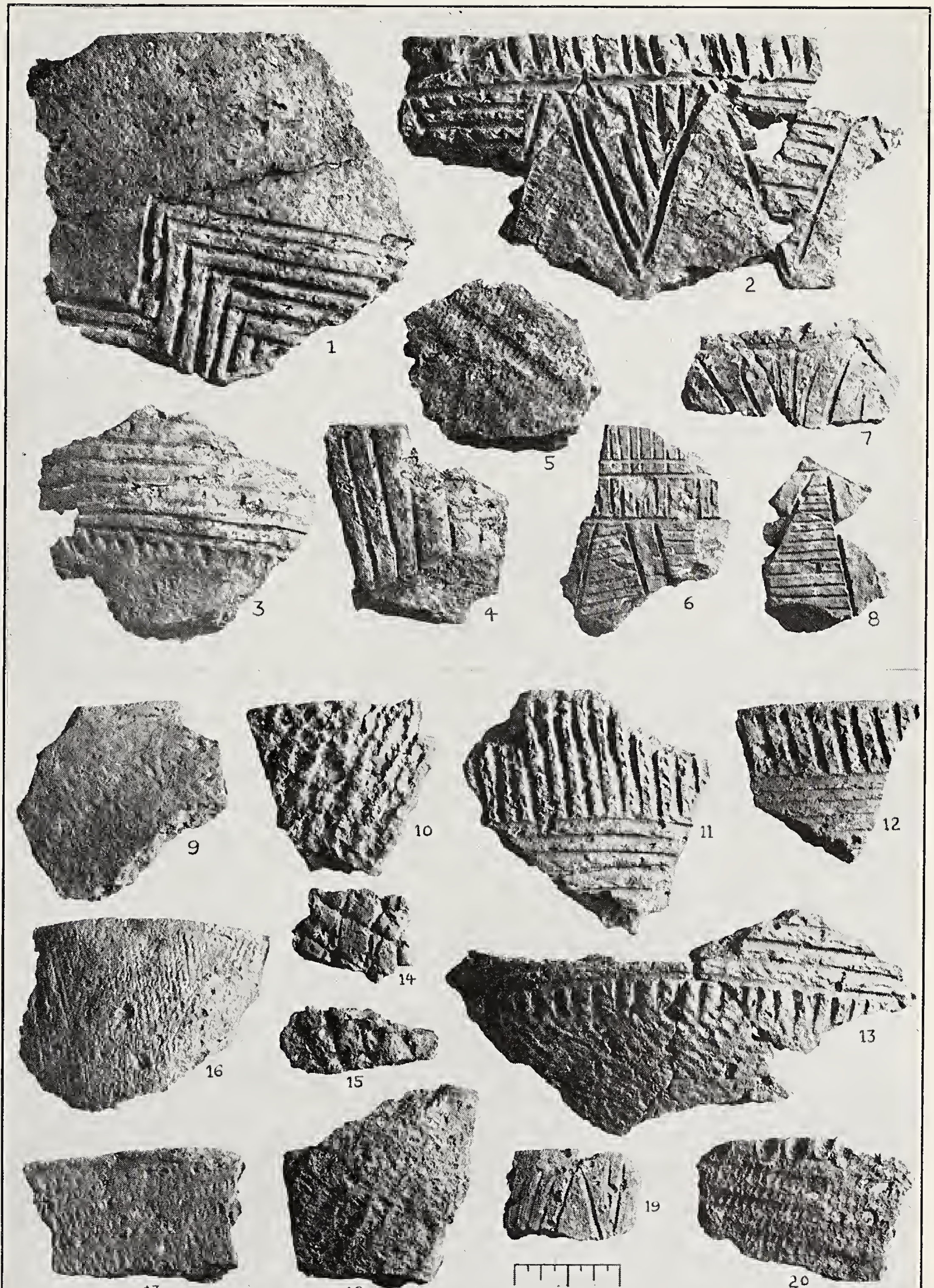


PLATE X

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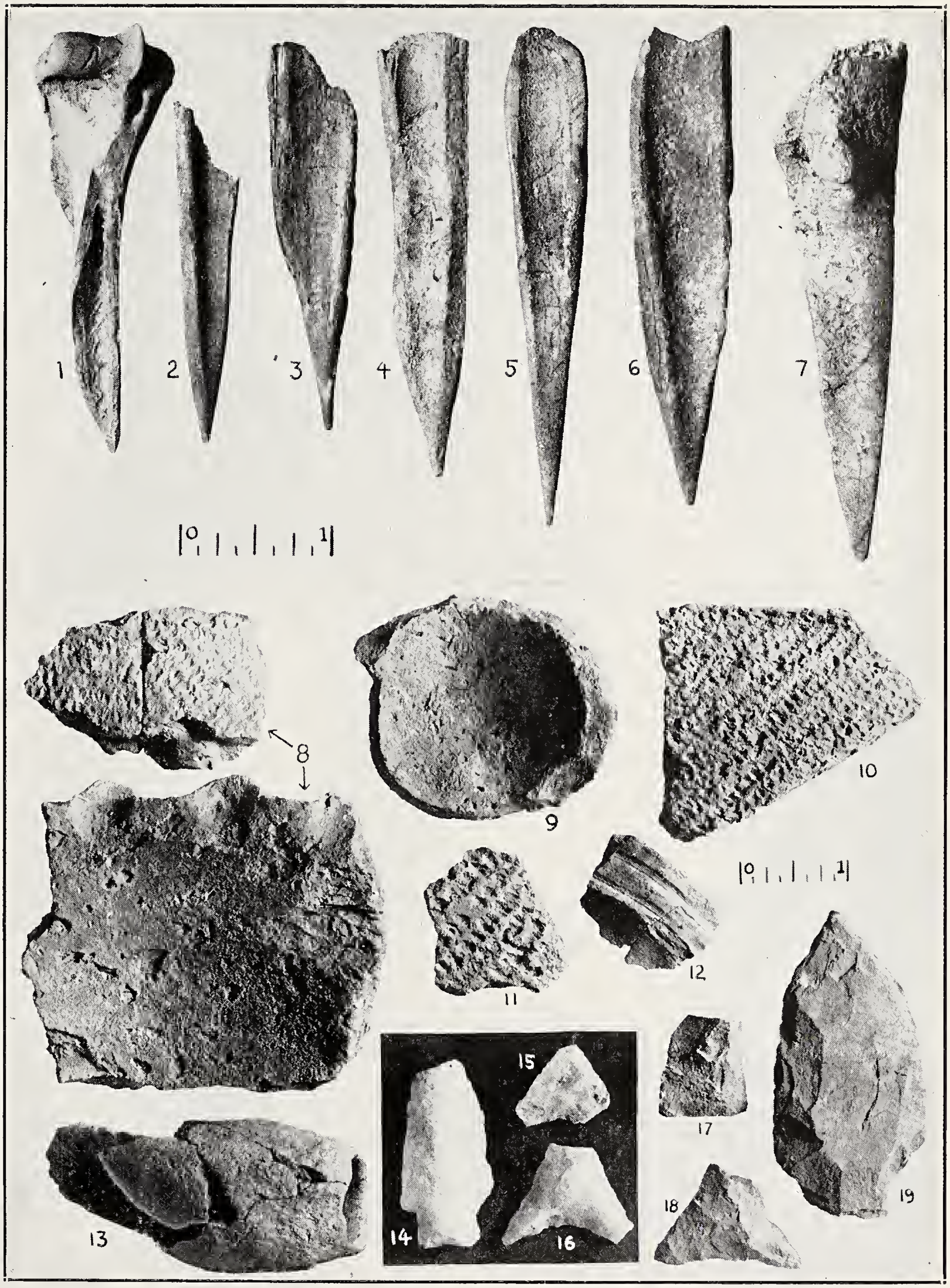
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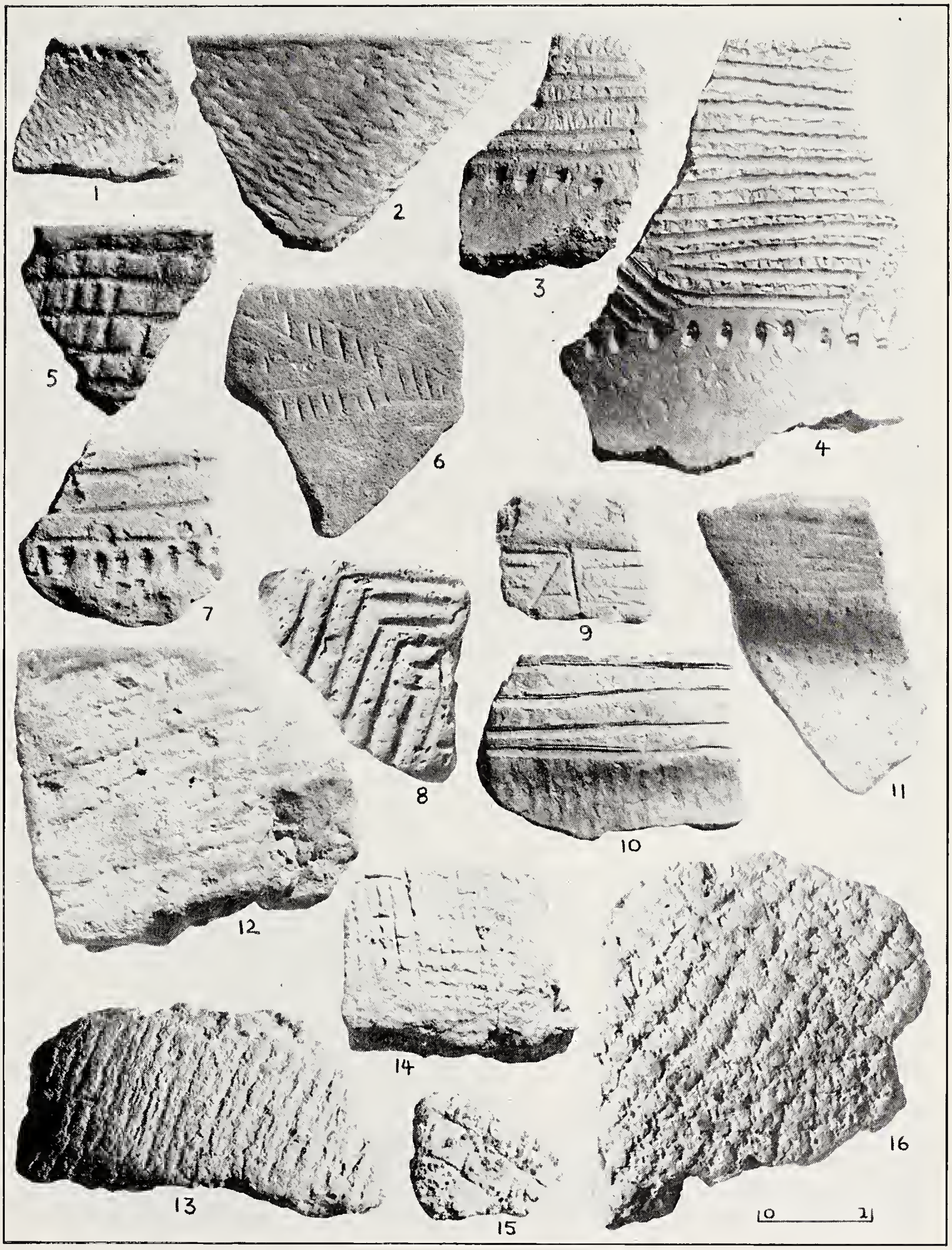
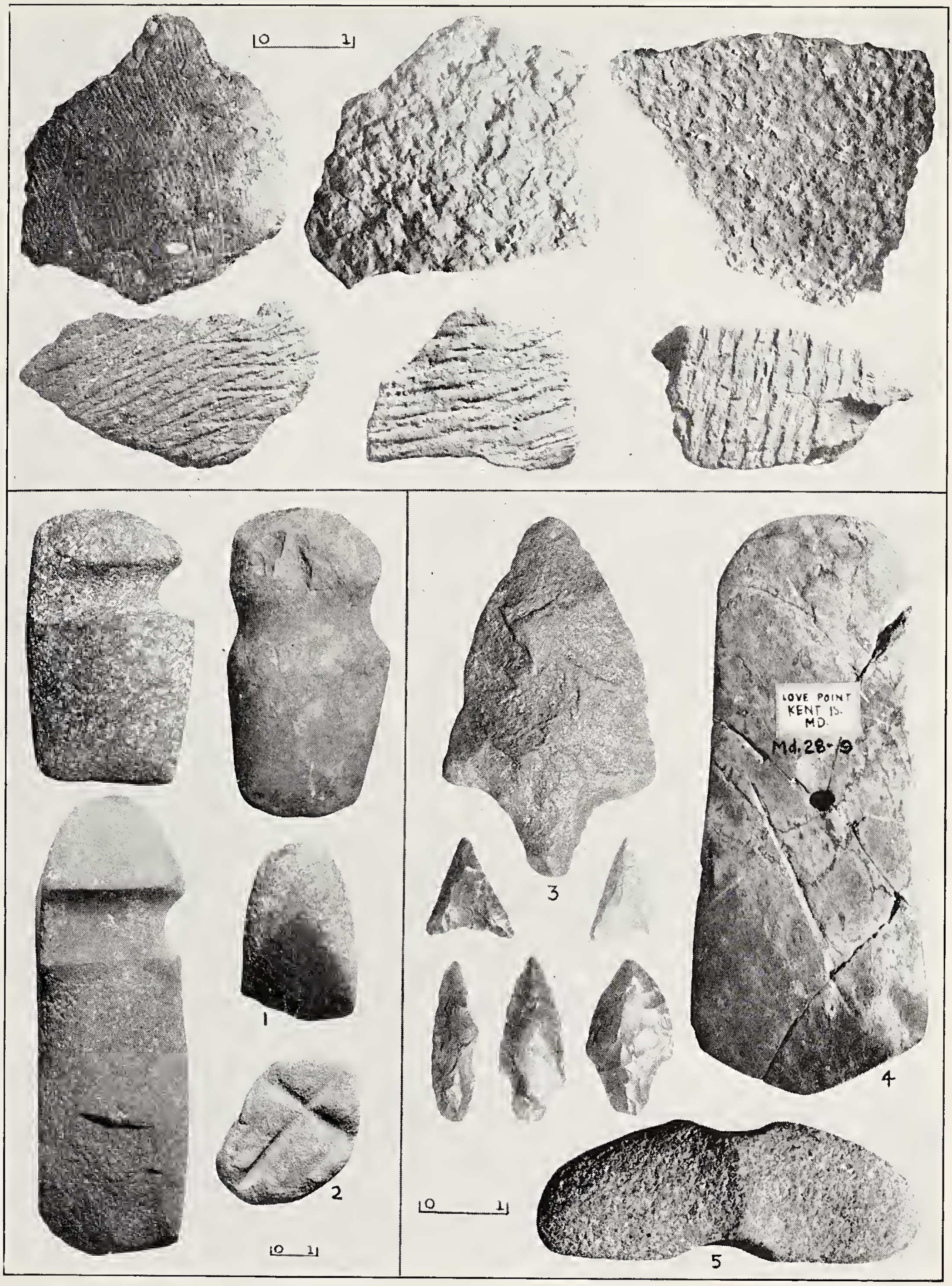
CONOWINGO, SUSQUEHANNA RIVER PLATE XIII

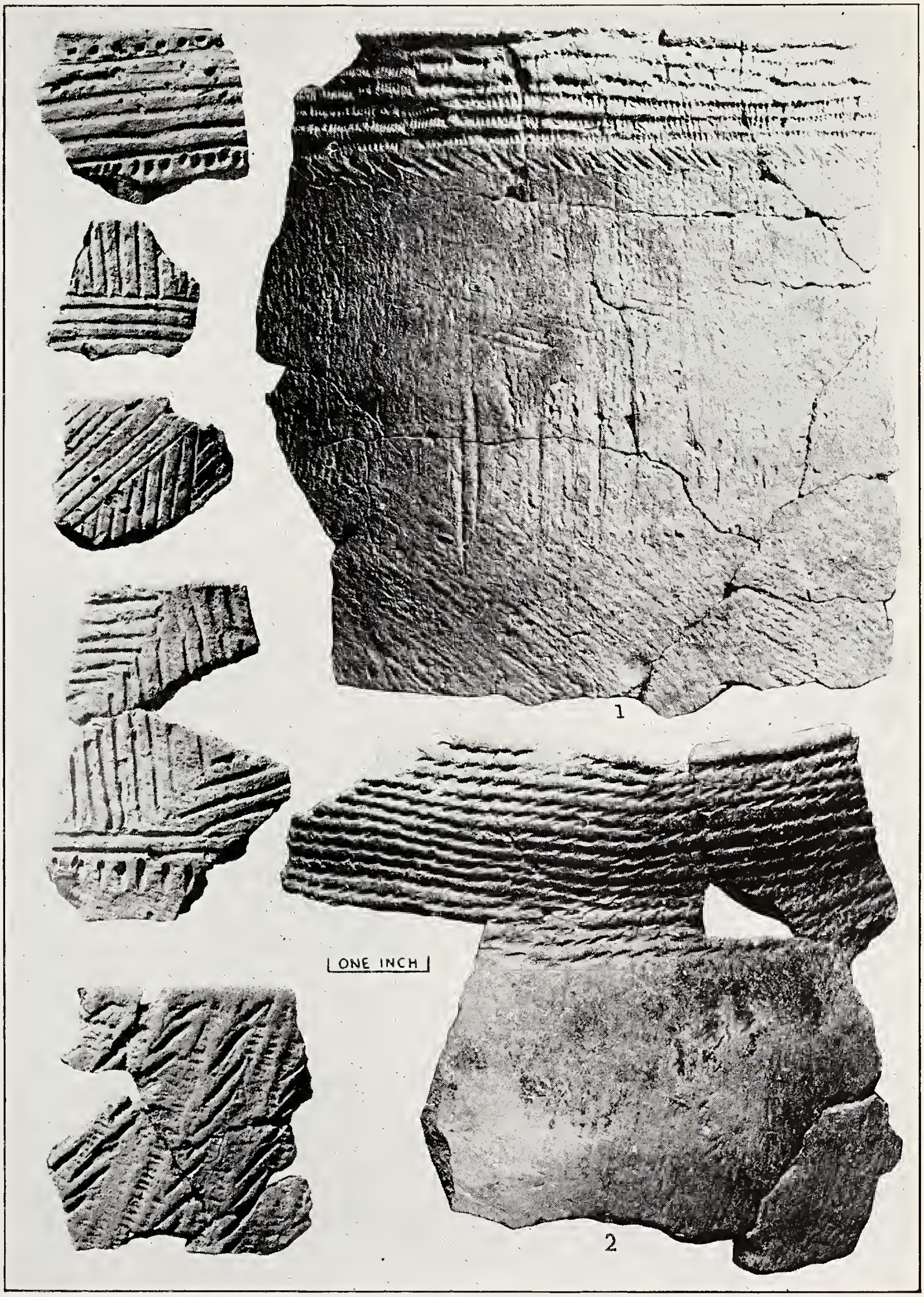


KENT ISLAND SITES PLATE XIV

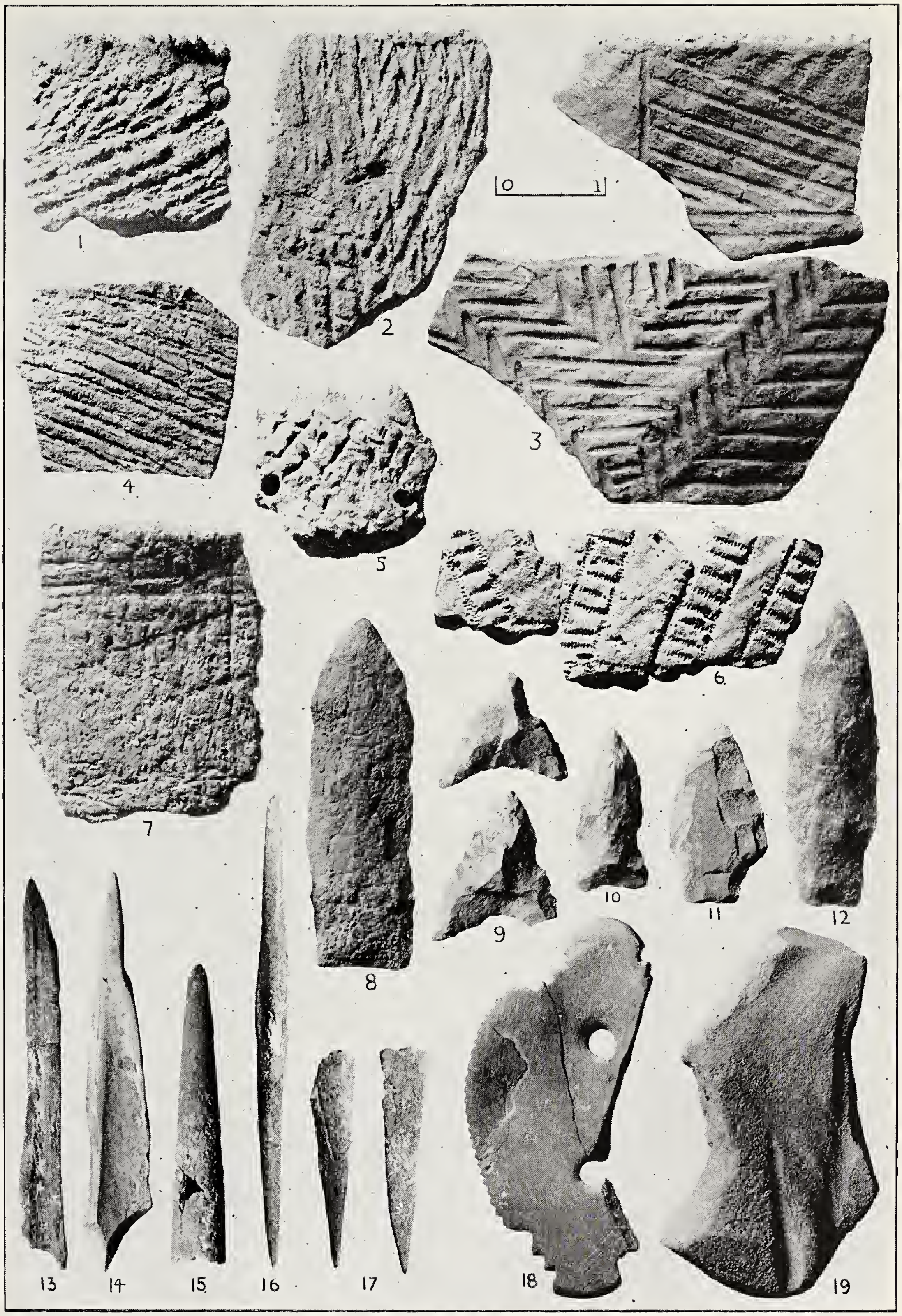


WEST BANK OF FORKED CREEK, MAGOTHY RIVER

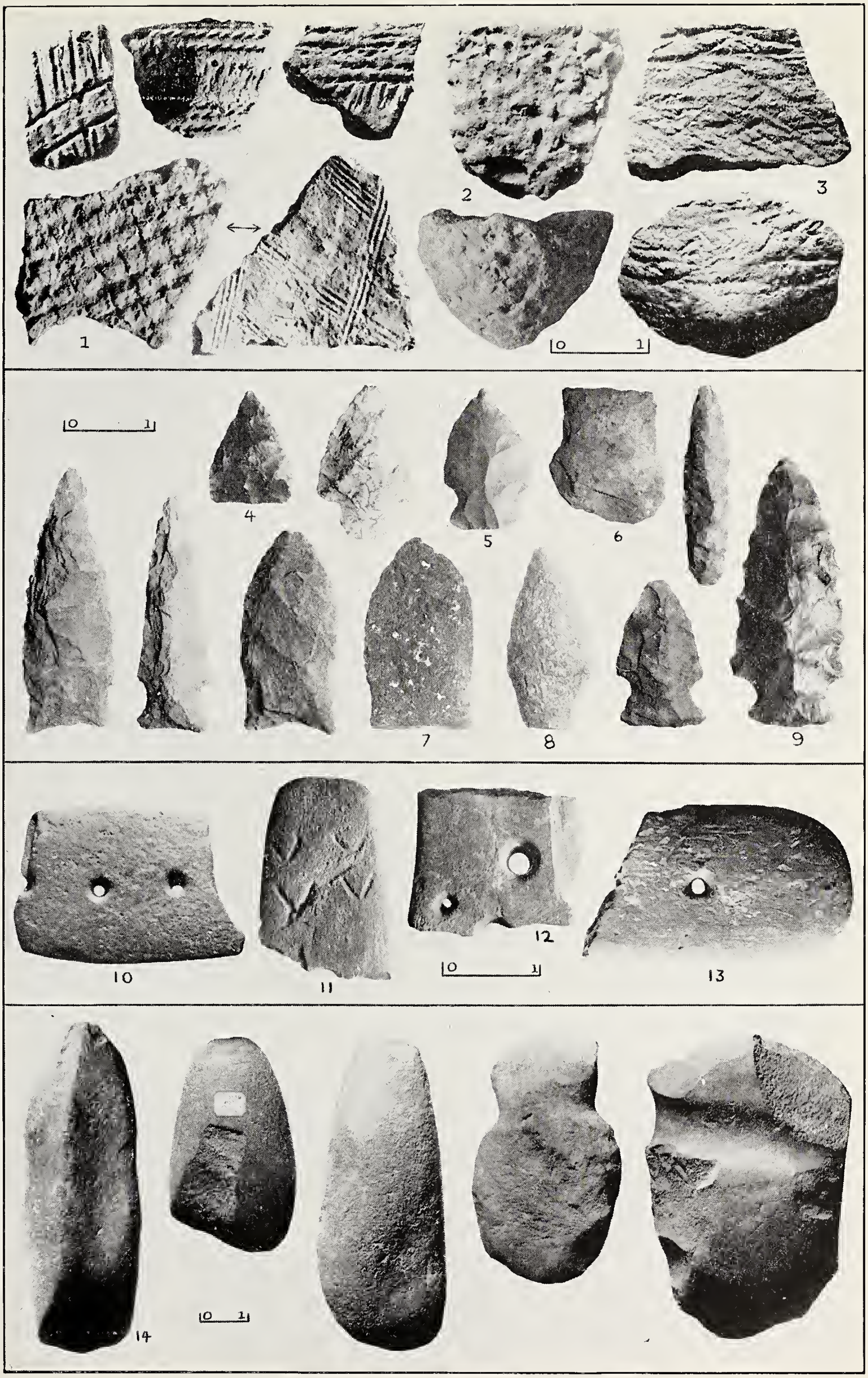
PLATE XV

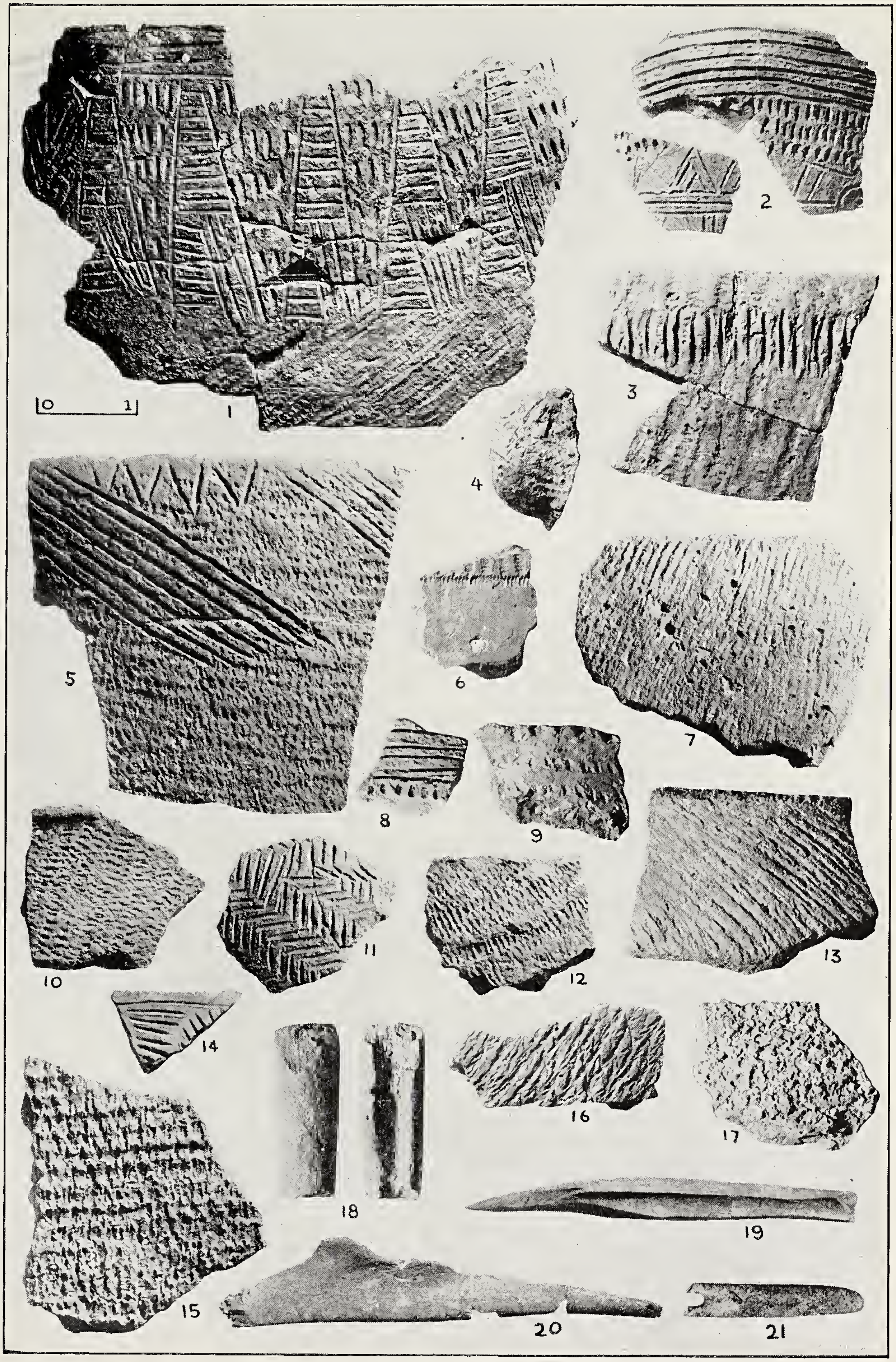


WEST BANK OF FORKED CREEK, MAGOTHY RIVER PLATE XVI



ULMSTEADS POINT, MAGOTHY RIVER PLATE XVII

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PROCEEDINGS
OF
THE NATURAL HISTORY SOCIETY OF MARYLAND

NUMBER 10

SOME INDIAN VILLAGE SITES
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LOWER PATAPSCO RIVER

BY
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CURATOR OF THE DEPARTMENT OF ARCHAEOLOGY

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U.S. National Museum

BALTIMORE, MARYLAND
JUNE, 1949

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By

Richard E. Stearns
Curator of the Department of Archaeology

Baltimore, Maryland

June, 1949

SOME INDIAN VILLAGE SITES OF THE LOWER PATAPSCO RIVER

Introduction

A number of Indian village sites are to be found along the banks of the lower Patapsco and several of its tributary streams, namely: Deep Run, Stony Run and Soapstone Branch. This area is on the geological fall line or ancient coast line of our continent, which in Maryland follows a line running through Havre de Grace, Laurel and the District of Columbia. The principal feature of this line is a drop from the highlands to the lowlands or alluvial coastal plain. Of the materials, consisting of sand, silt and gravel, which were carried down to the sea by the rivers of those ancient times, the gravel being the bulkiest remained at the mouths of the rivers, forming beds which exist to the present day along the entire length of the fall line. The pebbles and boulders found in th gravel beds in the vicinity of these village sites are predominantly quartz. These beds have been exploited commercially for many years.

The pebbles were used by the Indians in the manufacture of arrowpoints, of which great numbers have been found. Approximately 75% of all chipped implements collected in this area were made from these quartz pebbles.

With the exception of the site on Soapstone Branch, all of these village sites are on land which is or has been under cultivation and our collection of artifacts is all from the surface. The sites are shown on the map indicated by numbers and a line drawn around the area which they occupy.

Those who helped the writer to collect from this region were Mr. Albert Rubenstein and Mr. Frank Grimm. Others who have collected here in the past were Col. William H. Love and Mr. Charles Hayden. The whereabouts of Col. Love's collection is not known, but a large part of Mr. Hayden's collection was presented to the Natural History Society of Maryland by his widow. A considerable part of the collection is from the Patapsco and vicinity, including Pumphrey and Stony Run. In all cases the specimens from this area are identical in type to those we have found.

Among the more interesting specimens found by Mr. Hayden was a broken, but well made birdstone.from the north bank of the Patapsco opposite Brooklyn. This birdstone is now in the possession of Mr. Hayden's daughter. It is illustrated on the map by a drawing from memory. The purpose for which these birdstones was used has not been satisfactorily explained, but since they were perforated they were probably lashed to some object as an ornament or otherwise.

Sites on the Lower Patapsco River

The largest site which we have located on the Patapsco proper is just north of the highway bridge at Pumphrey and on the south bank of the river. This is site No. 20. It extends from the river bank to and a little beyond the road which parallels the river, and about a quarter mile along the river. This site has been des-

troyed in part by commercial operations, as much gravel has been removed from it, leaving a large rectangular pond in an area where once we found many artifacts.

At this locality we have found axes, celts, several fragments of gorgets, bannerstones, hammerstones and numerous arrowpoints.

We also found at this site a spade-like implement made of rhyolite, which bears considerable polish on the blade. One upper corner is broken off. This implement which was collected by Mr. Albert Rubinstein, is shown on Plate II, No. 22. We have no knowledge of any other spade-like implements from this region, although we did find a few flat blades of sandstone at Harmons (Site No. 12) but they bear no polish from use. One of these is shown on Plate I, No. 14.

The next site of any importance is about one mile and a half up river at Wades, (Site No. 24). This site extends along the river for a distance of a quarter mile, but we did not find such a concentration of material as at Pumphrey. All that we found at this place were arrowpoints.

A little over a half mile further up river is Site No. 21, which is of small size, but from it we recovered an axe and many arrowpoints.

Two sites were found on the north bank, the one at English Consul being the only site in this list to contain a shell heap. From this site (No. 11), which was not very large, we obtained some arrowpoints of quartz and rhyolite and a few sherds. The other site (No. 25) covers a rather large area but the evidence of occupation is scattered and we were never able to find more than a few arrowpoints.

Sites on Stony Run

The lower course of Stony Run is very hilly and we did not examine this area for sites. The first site to be encountered is at Stony Run Station. It extends on both sides of the run, but the most extensive part is on the west bank. We have found great numbers of arrowpoints here and the spearpoint of rhyolite shown on Plate III, No. 1. We also saw a spearpoint made of quartz, measuring 5 inches in length, which is of large size for this stone. We were not able to procure this implement as the farmer's little daughter wanted to give it to her teacher. An axe, a broken celt, and a gorget were also collected.

At Harmons there is another rather extensive site, (No. 12), of about the same size as the one at Stony Run Station. Aside from many well made arrowpoints we have found at this place a celt, some fragments of a steatite vessel and two gorget fragments. We also found two small end scrapers, one of which,made of black chert, is shown on Plate IV No. 2.

There are two sites on Kitten Branch, a small stream running into Stony Run from the east. This stream is shown on the maps of Anne Arundel County but is not named. Site No. 23 showed much

evidence of occupation, but as the tenant was not very friendly to us we did not collect much from this place. From the other site (No. 8) we found many arrowpoints, a pendant, a few sherds and a piece of a steatite vessel bearing a handle.

Sites on Deep Run

At Deep Run the first site is located on the west bank, directly at the junction of the run with the flood plain of the Patapsco (No. 1). This is a fairly large site and from it we have collected numerous arrowpoints, a broken celt, a bannerstone fragment and several sherds of clay and steatite.

Another site is located about a mile from the mouth of the run and on the same bank (Site No. 2). While this was of large size and showed much evidence of occupation in the way of chipped flakes and rejects, we were never able to make more than a small collection of arrowpoints.

In the neighborhood of Hanover there are several sites on both sides of the run, the one on the east bank being the largest in the entire area under consideration (Site No. 7). This place is known as the Disney Farm. Gravel has been taken from fields bordering the run, but this activity has been abandoned for the last seven or eight years. A large trench had been dredged from the lower edge of the northernmost two fields, these fields showing the most evidence of occupation. The occupied area has been by no means destroyed however. When we first visited this site in 1929 the northernmost field had not been trenched and the next field to the south had been only partly trenched at the lower end. It was almost impossible to take a step in any direction without finding some evidence of the presence of the aborigines, in the shape of chips and rejects or broken and complete arrowpoints. Altogether we found at this place over three hundred arrowpoints, a few small spearpoints, six axes, a few broken gorgets and bannerstones, some steatite sherds and a fragment of a roller pestle containing one of the polished ends. About twelve years ago the writer saw a small collection from this farm in the possession of some members of the Disney family, who still lived in the vicinity. This collection contained three grooved axes, some arrowpoints and two large spearpoints. The larger spearpoint was a slender stemmed point of rhyolite at least eight inches long, while the smaller was a broad stemmed point of quartzite about six inches long.

From the sites on the west bank of the run at Hanover we have recovered three axes, numerous arrowpoints, a fragment of a gorget, and a bannerstone. These sites are numbered 3, 4, 5, and 6, on the map.

A Site on Soapstone Branch

This site is located near the head of the western fork of Soapstone Branch, on a gently sloping hillside at the intersection of Rolling Road and Newburg Avenue, at Catonsville, Baltimore County. The area occupied by the site begins at the intersection

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of the two roads and extends down the slope to several springs near the run, comprising in all about three acres. The site is in woods and has never been under cultivation. The artifacts found here consist of pottery, arrowpoints, two axes and a broken bannerstone. These were found, some on the surface in places where the leaf mold covering had been eroded away, and some by excavation. None of them was found at any greater depth than one foot. This collection was formed by the sons of Dr. John A. Buchness, whose house is on part of the site. There are many quartz pebbles scattered through the earth here and in the general vicinity.

The arrowpoints collected here are similar to those found at the other sites described in this report; quartz being the principal material used in about 75% of them, the rest being of rhyolite and a few of chert. The bannerstone is of the short thick winged type. This is shown on Plate V, No. 3.

Of the two axes found, one is full grooved and the other is crudely made and is notched. Both are made of traprock.

The interesting feature connected with this site was the large amount of pottery found, as compared with the other inland sites of this area. The fact that the site was undisturbed may have something to do with the preservation of the sherds.

These sherds, some of which are shown on Plate V, are very similar to those we have found at some of the shell heap sites that produce incised decorated pottery. The tempering agent is crushed quartz. These sherds are impressed with cord-like marks except those of one vessel which showed basketry-like impressions. There were a number of sherds recovered but the actual vessels represented probably do not exceed a dozen. Two vessels have collared rims (Plate V, Nos. 1 and 2).

These sherds in their general appearance and type of decoration resemble very closely the sherds found at Tar Cove and the west bank of Forked Creek, on the Magothy River.

Description of Artifacts

The appearance of the bulk of the material from these sites is very consistent in type. From this it would seem that they were occupied by the same group of people. With the exception of the site on Soapstone Branch there was little pottery found, so it cannot be determined whether any particular type was preferred on a given site. That which was found however is identical with the sherd types found on the tidewater shell heaps. These sherds are illustrated on Plate II, Nos. 1-12, and Plate V. Evidently the use of pottery was not so essential on these inland sites as it was on the shell heap sites.

The various types of stone implements collected here are also found on the shell heap sites. Quartz was the predominant material used in making arrowpoints as it was found right at hand. Rhyolite was also used to a great extent, roughly 25% of all arrowpoints found consisting of this rock. Some few arrowpoints were

made of chert of a brownish grey to very dark color; all of these are stemmed except for one triangular specimen, illustrated on Plate III, No. 3. A broken spearpoint of bluish mottled flint or chert was found at Stony Run, Site No. 10. This specimen is illustrated on Plate III, No. 2. Several specimens of argillite were also recovered. Two from Stony Run, Site No. 10, are illustrated on Plate IV, Nos. 3 and 4. Two scrapers are shown on Plate IV, Nos. 1 and 2. No. 1 is made of rhyolite and No. 2 is made of black chert. There were only a few scrapers recovered from these sites. However, they were not found to any greater extent on any other site in the tidewater region that the writer has examined. The notches on some of the arrowpoints are smoothed as if they had been used as scrapers. On the other hand this may have been done intentionally to prevent cutting of the lashings that bound them to the arrows.

The chipped implements shown on Plates 3, 4 and 5 picture the full range of types found on these sites.

At this point it might be well to mention that an examination of surface collections found on the shell heap sites shows a larger percentage of rhyolite arrowpoints. This is probably due to the fact that quartz implements, being white, are more difficult to see against a background of oyster shells than rhyolite, which is a dark bluish grey in color. In excavating in the shell heap sites, we worked more slowly and found a much larger percentage of quartz implements.

Many axes and celts were recovered, those shown on Plate 1 representing only about half the number actually found by us. Axes were more abundantly found than celts.

All sites produced hammerstones. They are as a rule merely quartz boulders which show marks of hammering. Some pitted stones and abrading stones were collected, including one sinew stone with narrow grooves. While we have found only a few fragments of roller pestles, these were sufficient to demonstrate their use.

There were no bone objects or bones of any description found on these sites. The soil consists largely of sand and gravel and has very good drainage properties, which have a tendency to dissolve organic matter. As the soil in the tidewater regions bordering the Chesapeake Bay is also very sandy, the fact that so much bone material is found in the shell heaps is due to the protective covering of those same shells, which being of lime, neutralize the acid charged water that drains through from the topsoil.

The axes and celts shown on Plate 1 are from the following places:

Nos. 3, 7, 9, 10, 11 and 13 are from Hanover, Site 7.
Nos. 2, 4 and 5 are from Pumphrey, Site 20.
No. 6 is from Harmons, Site 12.
No. 8 is from Site 21.
Nos. 1 and 12 are from Hanover, Site 3.
No. 14 is a flat blade of sandstone from Harmons, Site 12.

A description of the sherds shown on Plate II is as follows:

No. 1, from Hanover, Site 7. From near bottom of vessel, surface. unimpressed. Probably contained shell as tempering material, but this has leached out.
No. 2, from mouth of Deep Run, Site 1. This sherd is impressed with cord and is tempered with crushed quartz.
No. 3, from Stony Run Station, Site No. 10. Tempered with steatite.
Nos. 4 and 6, from Stony Run Station, Site 10. Surface impressed with fabric. No. 4 probably tempered with shell, which has leached out. No. 6 tempered with crushed quartz.
No. 5, from Hanover, Site 7. This sherd is impressed with fabric and probably contained shell as tempering material, which has leached out.
Nos. 7 and 8, from Harmons, Site 12. These sherds are tempered with steatite.
No. 9, from Stony Run, Site No. 10, probably tempered with shell which has leached out.
No. 10, from mouth of Deep Run, Site 1. Cord impressed, tempered with mica and quartz.
No. 11, from mouth of Deep Run, Site 1. Decorated with parallel incised lines, probably tempered with shell which has leached out.
No. 12, from Kitten Branch, Site 8. Surface impression and design applied with cords. Probably contained shell as tempering material, which has leached out.

A description of the stone objects shown on Plate II is as follows:

No. 13, Gorget from Hanover, Site 7.
No. 14, Broken bannerstone from Hanover, Site 7. This has two holes bored through the wing for a lashing.
No. 15, Gorget from Wades, exact site not known.
No. 16, Grooved pendant from Kitten Branch, Site No. 8.
No. 17, from Stony Run Station, Site No. 10.
No. 18, Gorget from Hanover, Site No. 5.
No. 19, Broken bannerstone from Hanover, Site No. 5.
No. 20, Steatite sherd from Kitten Branch, Site No. 8. This sherd is shown one-half the size of the other objects on this plate.
No. 21, Gorget from Stony Run Station, Site No. 10.
No. 22, Rhyolite spade from Pumphrey, Site No. 20.

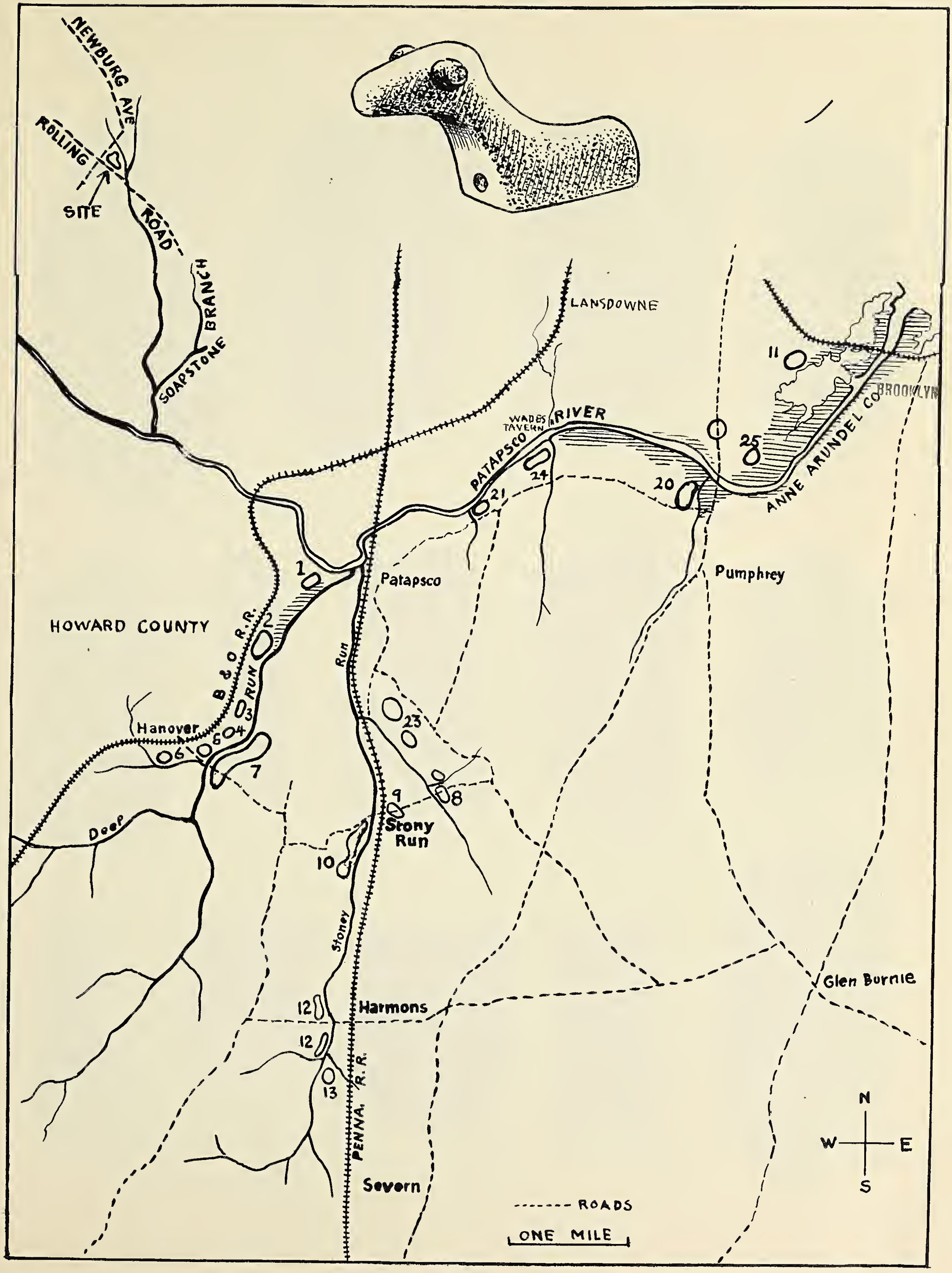

NEWBURG AVE
ROLLING
ROAD
SITE
SOAPSTONE BRANCH
LANSDOWNE
WADES TAVERN
PATAPSCO RIVER
11
BROOKLYN
ANNE ARUNDEL CO.
25
20
24
21
Patapsco
Pumphrey
HOWARD COUNTY
1
2
B & O R.R.
RUN
3
Hanover
4
5
6
7
Deep
Run
23
8
9
Stony Run
10
Stoney
Harmons
12
12
13
PENNA. R.R.
Severn
Glen Burnie
N
W
E
S
ROADS
ONE MILE

PLATE 1

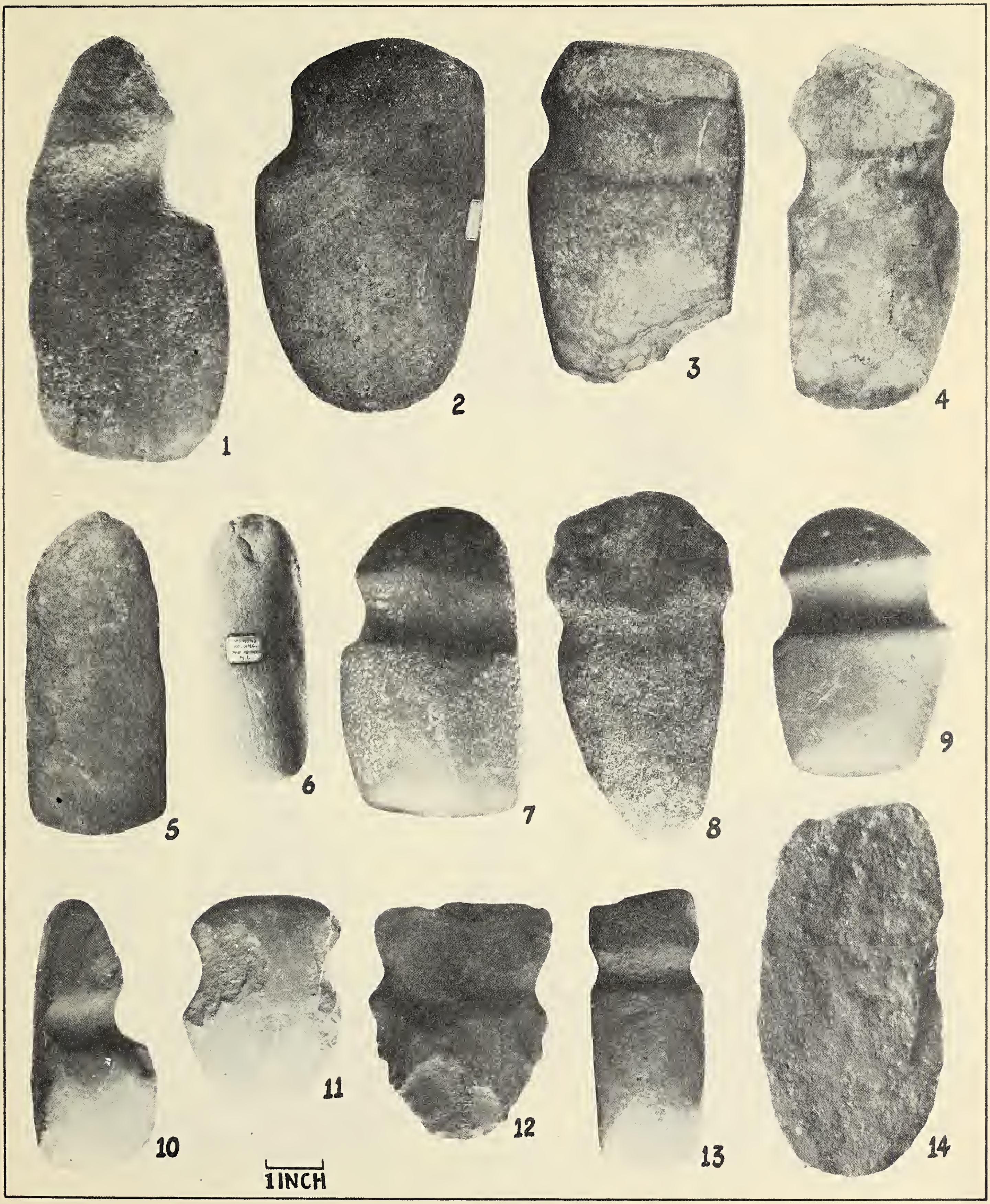
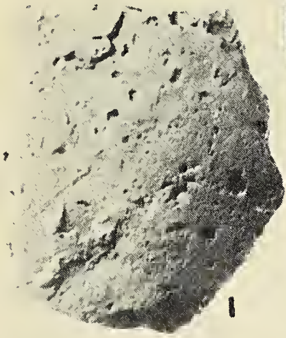


PLATE 2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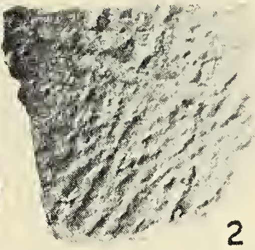
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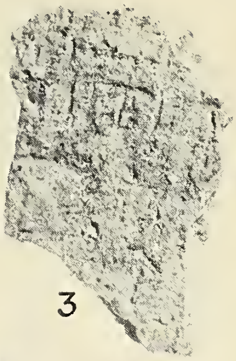
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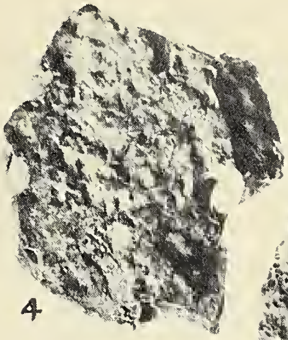
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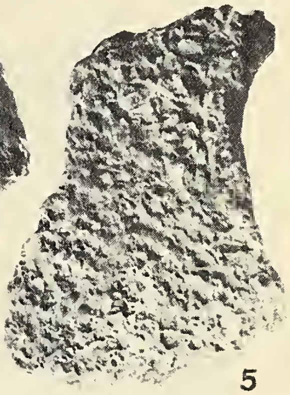
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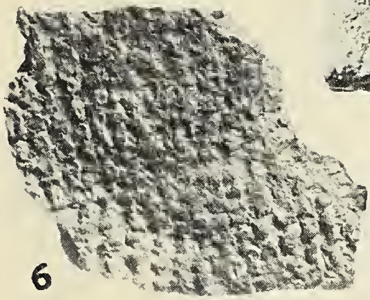
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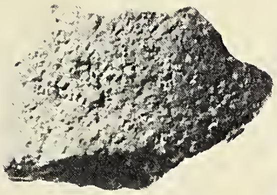
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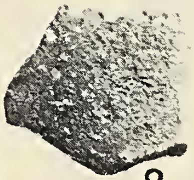
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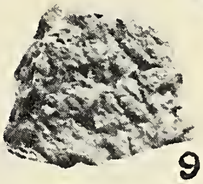
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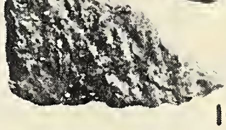
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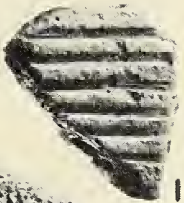
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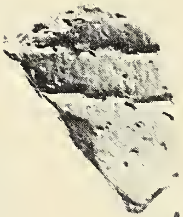
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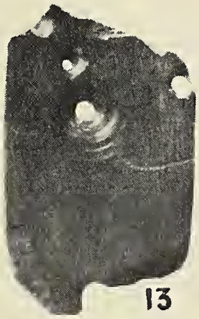
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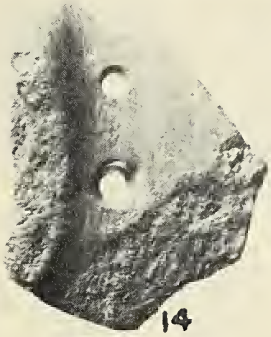
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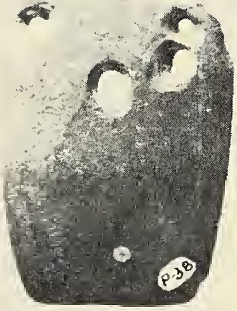

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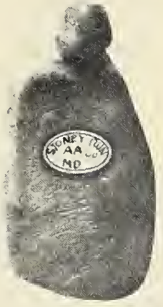

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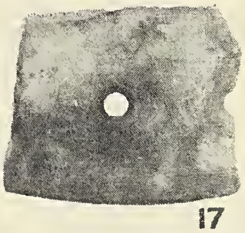
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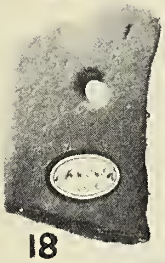
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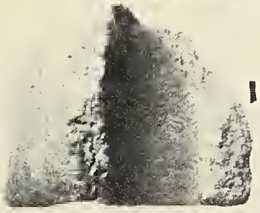
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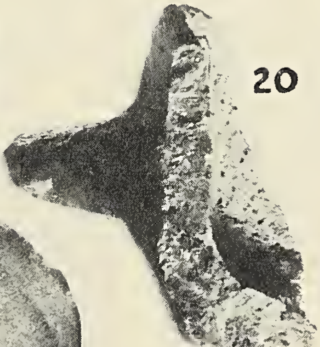
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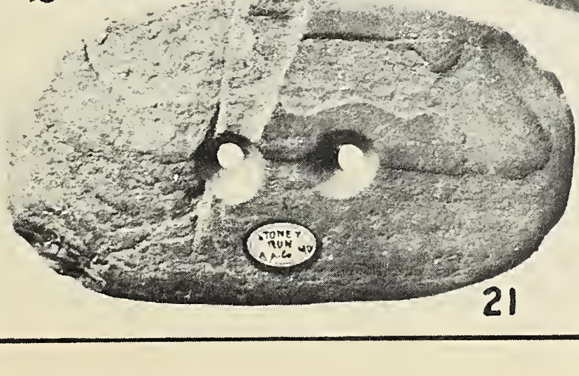

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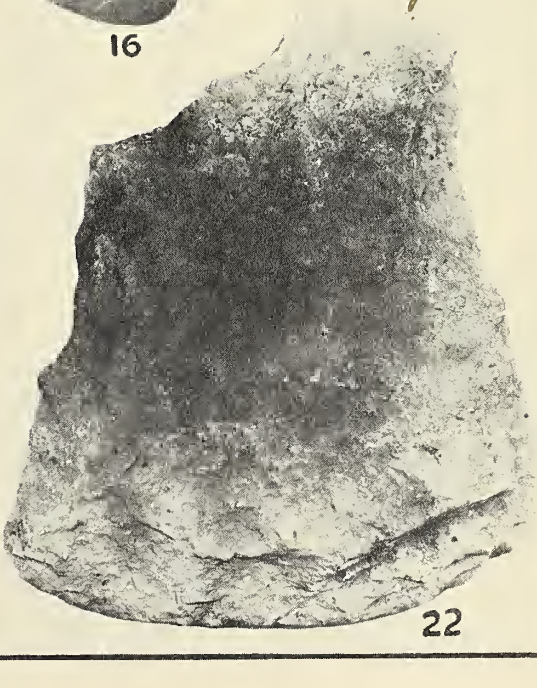
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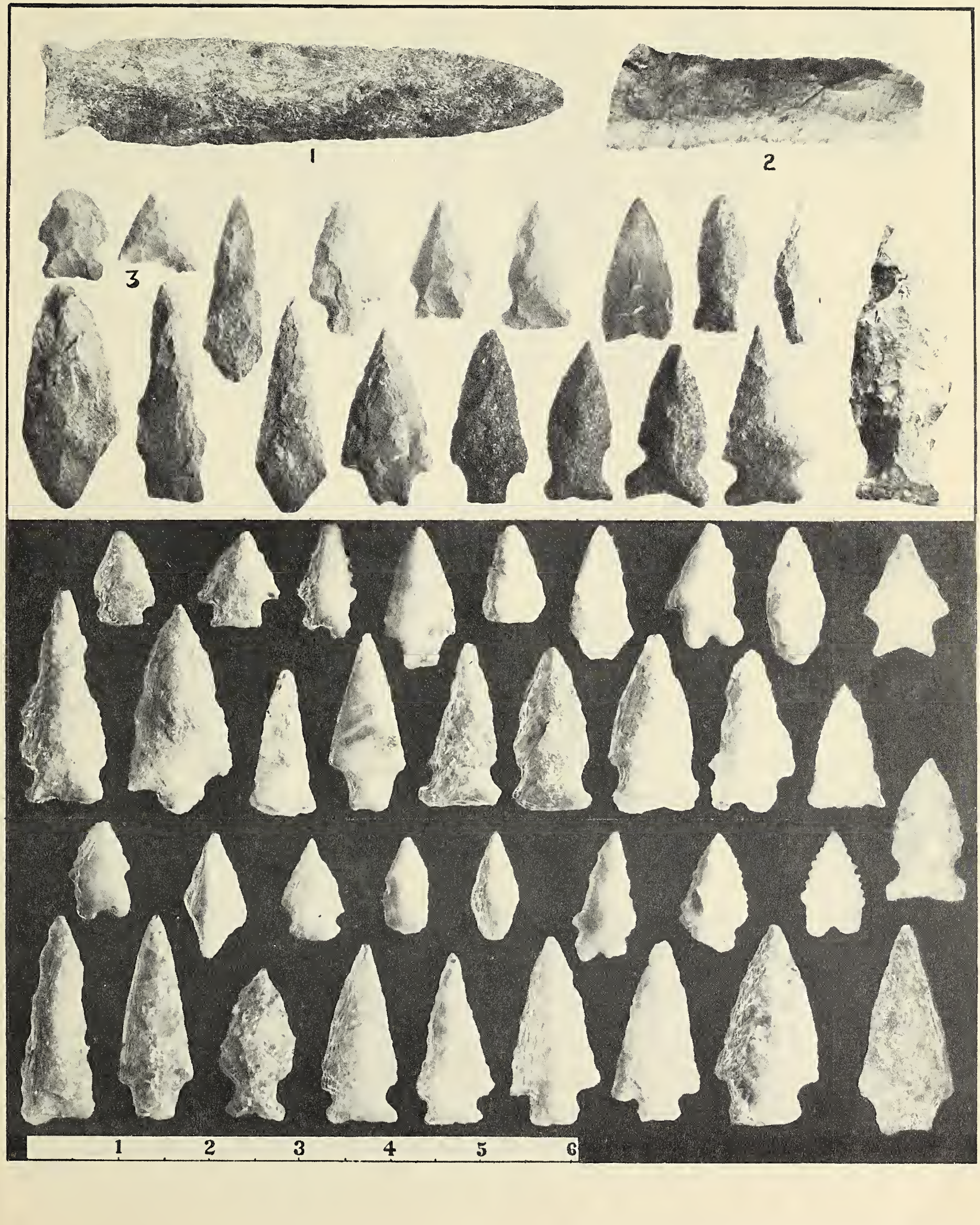
PLATE 3



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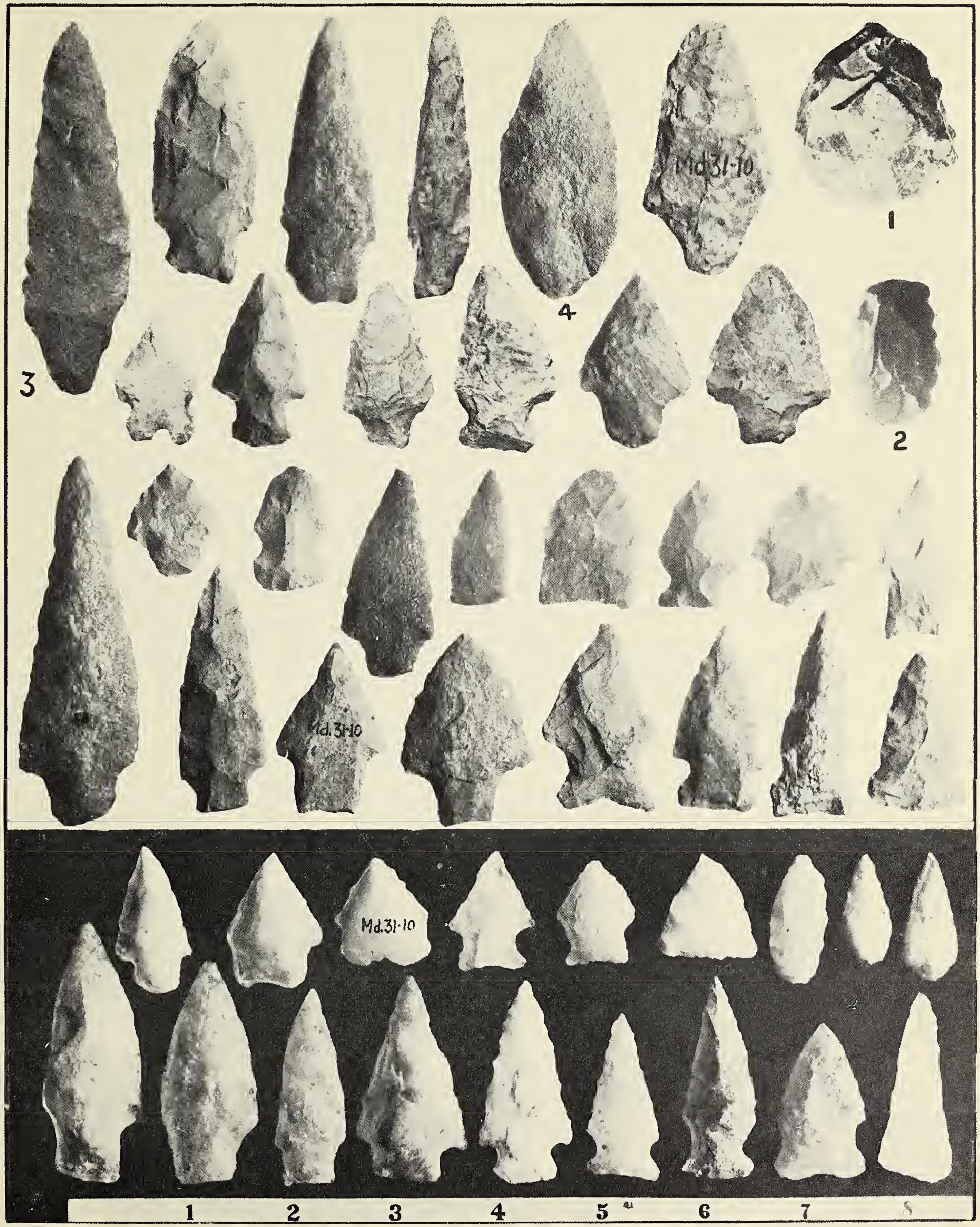

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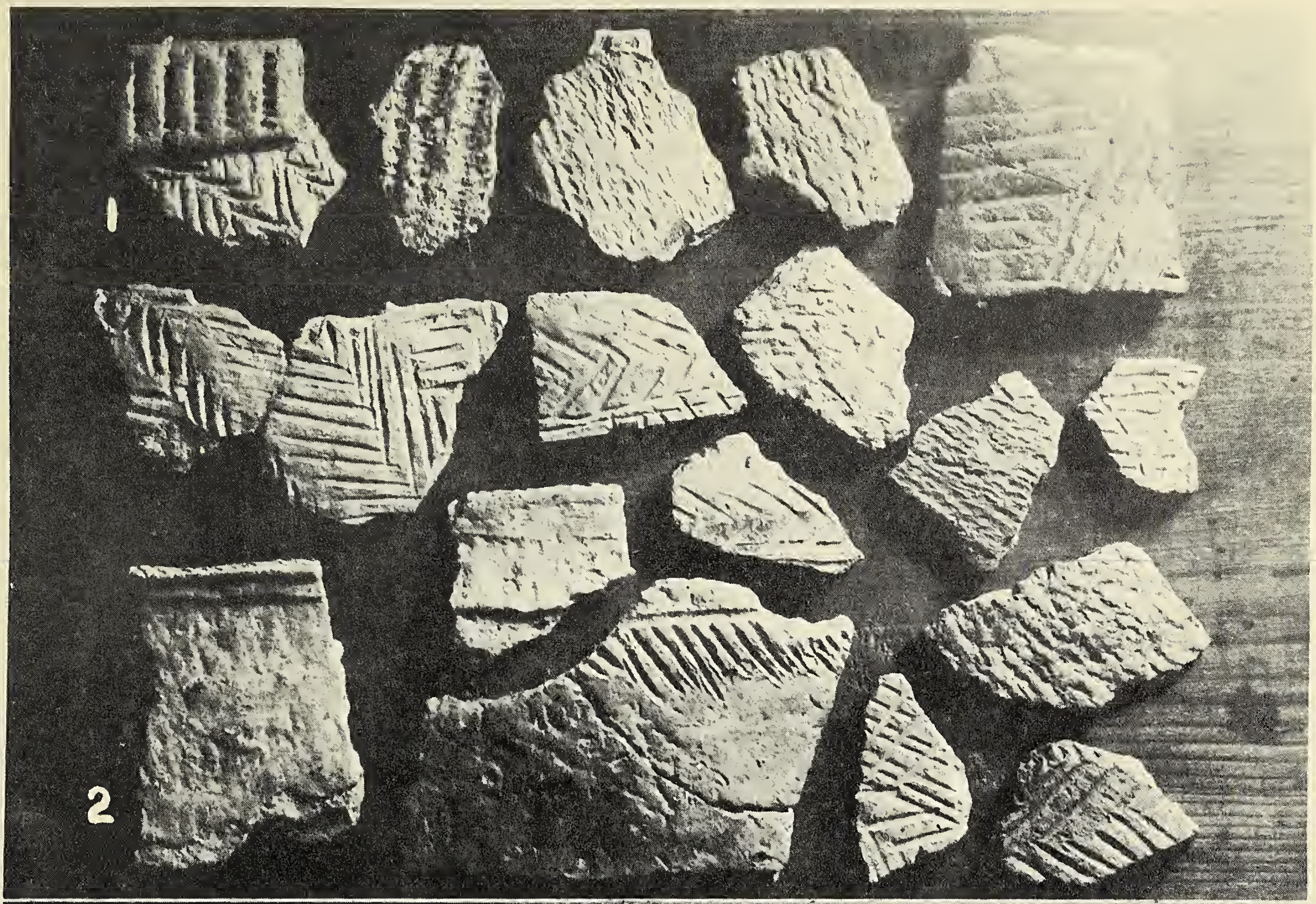

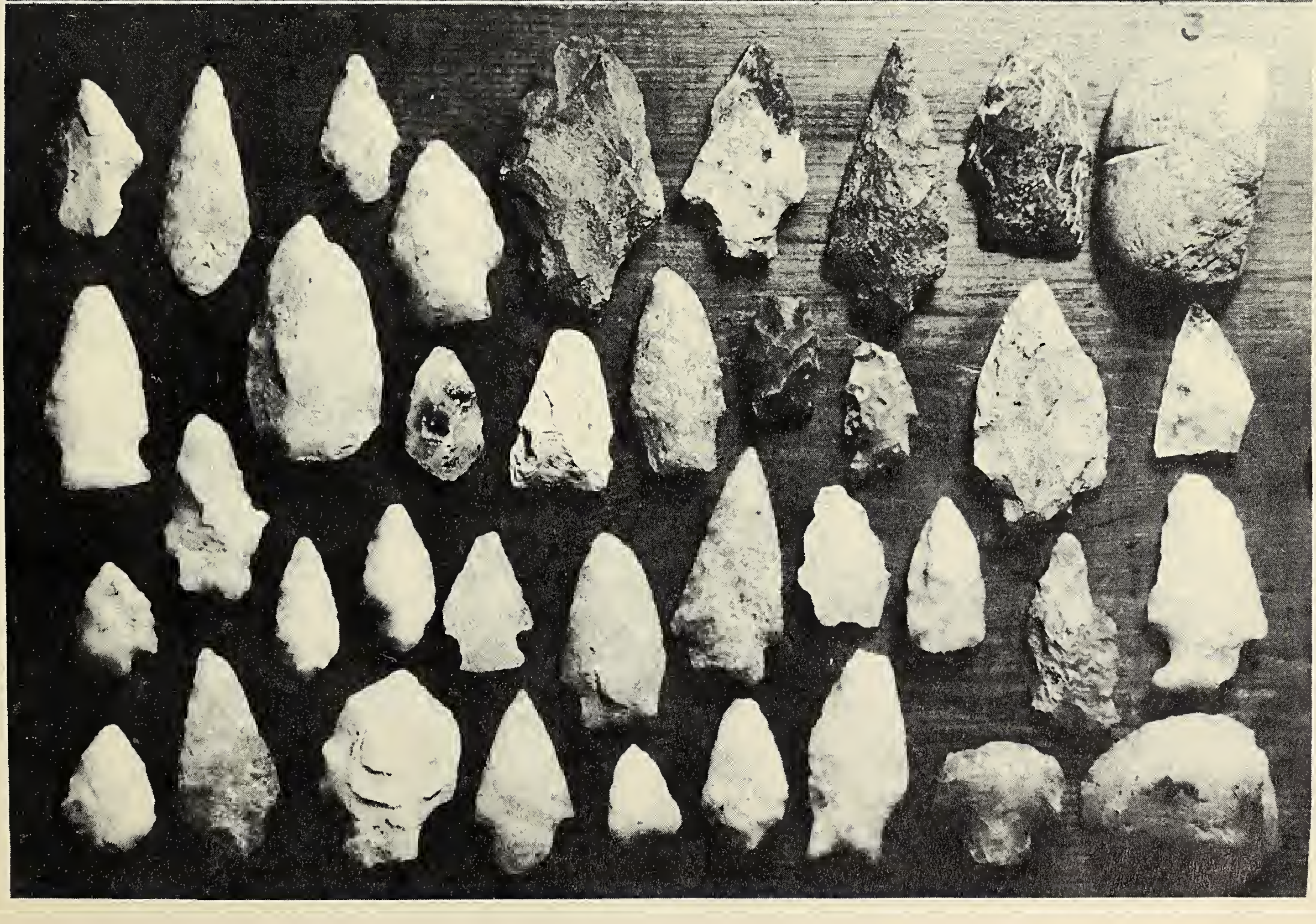

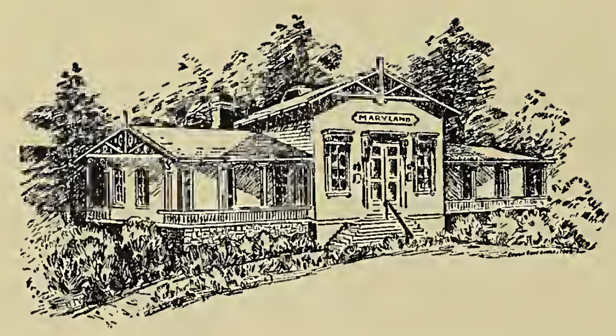

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